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VETERINARY JOURNAL

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Biography

PROFESSOR S. H. GAIGER, F.R.C.V.S.

ANOTHER professional year has passed—a year full of momentous issues from the educational aspect of the student and future graduate; and in voting its thanks to the Past-President, the Council (and with this elected representative body must be included the members of the profession) welcomes the new occupant of the Chair who has been selected to guide their destinies for at least the next twelve months.

The appointment which he holds as Professor of Veterinary Pathology in the University of Liverpool gave him additional opportunity for exploiting the numerous researches in which his activities had been engaged, and the flock-masters of Great Britain in particular owe more than they can ever appreciate to the attention which Professor Gaiger has given to the elucidation of certain devastating sheep diseases. Always keeping in view the *practical* application of laboratory results *under the natural conditions as met with in the field*, Professor Gaiger's researches have saved the agriculturists thousands of pounds, for which it is to be hoped they are duly grateful. As a successful teacher he is popular with his students, and in all veterinary assemblies his opinions are listened to with attention.

As President of the Council, Professor Gaiger can be relied upon to hold the position justly and fairly, and in a manner which will not only reflect credit upon himself, but upon the profession of which he is such an able scientific worker.

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General Articles

AGRICULTURAL RETURNS OF ENGLAND AND WALES, 1933.

Livestock.

WITH the exception of cattle, which show an increase of 4.1 per cent., the numbers of livestock returned are smaller this year than in 1932. Sheep have declined in numbers by 2.2 per cent., pigs by 3.8 per cent., and horses by 1.6 per cent.

CATTLE.

	1933	1932	Increase		Decrease	
	No.	No.	No.	Per cent.	No.	Per cent.
Cows and heifers in milk ...	2,179,600	2,116,600	63,000	3.0		
Cows in calf, but not in milk	358,000	352,000	6,000	1.7		
Heifers in calf	418,000	402,800	15,200	3.8		
Other cattle—						
Two years and above ...	997,400	938,900	58,500	6.2		
One year and under two	1,356,800	1,241,800	115,000	9.3		
Under one year ...	1,312,000	1,305,900	6,100	0.5		
Total of cattle	6,621,800	6,358,000	263,800	4.1		

The total number of cattle in the country has increased annually since 1930, and at 6,621,800 the total this year is the highest on record. The dairy herd also is larger than in any previous year for which figures are available : the net increase during the year is 84,200. Cows and heifers in milk have increased by 63,000, or 3 per cent. ; cows in calf by 6,000, or 1.7 per cent. ; and heifers in calf by 15,200, or 3.8 per cent. In England the increase in the dairy herd is general, but in Wales five counties returned numbers slightly below those returned in 1932. Increases in the dairy herd in the various divisions range from 1.2 per cent. in the two Welsh divisions to 6.7 per cent. in the South-Eastern division.

There is also an increase in the numbers of " other cattle " : those two years old and above have increased by 58,500, or 6.2 per cent. ; those over one year but under two years, by 115,000, or 9.3 per cent. ; and those under one year old by 6,100, or 0.5 per cent. The numbers of " other cattle " over one year old show a general increase throughout the country, but those under one year have declined in numbers in a few counties in England and in every county in Wales.

The total number of sheep in the country is smaller by 410,100, or 2.2 per cent., than in 1932. There is, however, an increase of 129,000, equivalent to 1.7 per cent., in the number of breeding ewes, which has raised the total to 7,763,300, the

highest total since 1909. With the exception of the North-Eastern division, where a reduction in the numbers of breeding ewes amounting to 2.1 per cent. has occurred, the increases are general, and range from 0.4 per cent. in the Northern

SHEEP.

	1933	1932	Increase		Decrease	
	No.	No.	No.	Per cent.	No.	Per cent.
Ewes kept for breeding ...	7,763,300	7,634,300	129,000	1.7		
Other sheep—						
One year and above ...	2,435,700	2,953,400			517,700	17.5
Under one year ...	7,886,300	7,907,700			21,400	0.3
Total of sheep ...	18,085,300	18,495,400			410,100	2.2

division to 4.5 per cent. in the East Midland division. In Wales the increase is approximately 1 per cent. " Other sheep " show a decrease in numbers, which is much more marked in those one year old and above, than in the case of those under one year.

PIGS.

	1933	1932	Increase		Decrease	
	No.	No.	No.	Per cent.	No.	Per cent.
Sows kept for breeding ...	404,600	425,200			20,600	4.8
Other pigs...	2,659,800	2,759,400			99,600	3.6
Total of pigs... ...	3,064,400	3,184,600			120,200	3.8

The number of pigs in the country is smaller than in 1932. Sows have decreased by 20,600, or 4.8 per cent., and " other pigs " by 99,600, or 3.6 per cent. The total decline amounts to 120,200, or 3.8 per cent. With the exception of the Eastern division, where there is an increase in the number of sows amounting to 1.4 per cent., the number of sows has declined generally throughout the country ; the decreases range from 2.4 per cent. in the Northern division to 11.7 per cent. in South Wales. In the case of " other pigs," the decrease has not occurred in every county, and in the Eastern and South-Eastern divisions there are net increases amounting to 6.4 per cent. and 1.5 per cent. respectively. In the other divisions of the country decreases are reported ranging from 0.1 per cent. in the East Midland division to 14.1 per cent. in South Wales.

Although the total number of horses in the country has continued to decline, the rate of decrease is diminishing, and the decrease this year amounts to only 14,800 or 1.6 per cent., as compared with a decrease of 21,400, or 2 per cent., last year. Horses used for agricultural purposes (including mares kept for breeding) have declined in numbers by 9,700, or 1.5 per cent., as against a decrease of 11,400, or 2 per cent., in 1932. The most important feature, however, is the continued increase in the number of foals, which at 2,100, or 5.4 per cent., is greater than

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last year, when the increase amounted to 1,300, or 3 per cent. The increase has occurred in the numbers of foals from heavy horses; foals from the lighter breeds show a small decline.

HORSES.

	1933	1932	Increase		Decrease	
	No.	No.	No.	Per cent.	No.	Per cent.
Horses used for agricultural purposes (including mares for breeding)	645,400	655,100			9,700	1.5
Unbroken horses (including stallions)—						
One year and above ...	84,900	83,600	1,300	1.6		
Under one year ...	41,200	39,100	2,100	5.4		
Other horses...	130,800	139,300			8,500	6.1
Total of horses	902,300	917,100			14,800	1.6

Ministry of Agriculture and Fisheries.
August 1st, 1933.

THE MILK MARKETING SCHEME.*

THE Milk Marketing Scheme, which applies to England and Wales, has now been approved by Parliament, and will forthwith be referred to the milk producers in England and Wales in order that they may decide by a poll whether the Scheme shall come into operation or not.

Registration and Voting.—The Scheme thus enters a "suspensory period" to allow time for the milk producers to become registered with the Milk Marketing Board and for the poll of registered producers to be taken. Within the next few days all producers will have received registration forms, and it is important for them to note that unless they register before August 19th they will not be entitled to vote on the initial poll. Producers should, therefore, make certain that their registration forms are filled in and returned to the Board before that date. Voting will take place later, on forms to be sent to all producers who register, and voting papers are required to be returned not later than September 2nd next. Unless the results of the poll show that not less than two-thirds of the registered producers voting, counting numbers and output, are in favour of the Scheme, it will lapse.

Brief Description of Scheme.—The Scheme provides for the constitution of the Milk Marketing Board, to be elected by the registered producers in England and Wales, and for the establishment of eleven provincial regions, each with a regional committee elected by the registered producers in the region. These regional committees are to advise the Board as to the working of the scheme in

* Report from the Ministry of Agriculture, August 2nd, 1933.

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the regions. The classes of producers who will be exempted from registration, and consequently from the operation of the scheme, are those : (*a*) who have not more than four milch cows (provided they do not sell milk by retail) ; and (*b*) who do not carry on the business of selling milk otherwise than to their servants for domestic consumption. *All other milk producers should register. Producers who are neither registered nor exempt from registration will not be allowed to sell any milk.*

The Board will have power to prescribe the form and the terms (including prices) of the contracts for the sale of milk by registered producers, and in particular they may prescribe as a term of the contract that the purchase price shall be paid by the purchaser to the Board, that the contract shall be conditional upon its registration and confirmation by the Board, and that the Board shall be entitled to enforce, as agents of the producer, any provisions of the contract that the producer himself is entitled to enforce. The Board will also be able to prescribe the additional premiums which the registered producers shall be paid for graded milk, level deliveries, and special services. Prices to be prescribed by the Board for the sale of milk for liquid consumption may vary in different districts and, in the case of milk for manufacture, according to the purpose for which the milk is used. Producers who desire to sell milk by retail must obtain a retail licence from the Board, but the Board are not entitled to refuse a licence to any registered producer who applies for one unless he has previously held a licence which has been revoked.

In order to encourage a higher standard of production the Board may pay a bonus, called the " guaranteed quality premium," to registered producers who satisfy the Board that they are complying, and will continue to comply, with the conditions laid down by the Board for securing purity and good quality of milk. There will be a special register of these producers, who will be known as " accredited producers."

The fundamental principle of the Scheme will be the equalisation of the proceeds of all sales of milk wholesale by the registered producers in each region, so that each producer will receive a " pool " price for his milk irrespective of whether it is sold for liquid consumption or for manufacture. By means of an adjustment, termed the Inter-Regional Compensation Levy, the regions having a high proportion of sales for liquid consumption will contribute towards the pool price in regions that sell milk largely for manufacture. The premiums for level deliveries, graded milk and special services, and the guaranteed quality premiums, will not be pooled, so that producers who earn these preminums will receive them in addition to the pool price. The producer-retailer will be required to play his part by making contributions equivalent to those of other producers.

It is obvious that an immense amount of detailed accounting work will be involved in the pooling arrangements, and that a little time must elapse before the necessary machinery can be set up. Accordingly, it has been provided in the Scheme that the pooling provision shall not come into force until the Board

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prescribe, as a term of the contract, that the purchase price shall be paid to the Board. When the pooling provisions are in operation, any registered producer —unless he is in receipt of level delivery premiums—who has not been able to find a purchaser for his milk on the terms of the contract prescribed by the Board, may, subject to certain conditions, require the Board to buy his unsold milk.

For the first year of the operation of the scheme the Board will be under an obligation before they determine prices or prescribe any terms of the contract which may affect prices, to consult with the organisations representing distributors, manufacturers, and other purchasers of milk by wholesale, together with not more than three persons nominated by the Minister. In the event of the Board and the buyers being unable to agree as to prices, the Minister's nominees are empowered to fix the prices, and any prices so fixed will be binding upon the Board.

Copies of the Milk Marketing Scheme can be obtained from His Majesty's Stationery Office, or through any bookseller, or from the offices of the Milk Marketing Board at Thames House, Millbank, London, S.W.1.

TOWN MILK SUPPLY IN THE UNITED STATES.

In the *Schweizreische Milchzeitung*, No. 61–65 (1932), R. Burri, Director of the Federal Establishment for Bacteriology and Dairying of Liebefeld-Bern, gives a survey of the impressions he received during a tour undertaken for the Bureau of Health of the League of Nations.

Legislation relating to the town milk supply varies considerably from State to State in North America, particularly as regards grading. In addition to first quality certified milk there are three other grades of raw and pasteurised milks. Those opposed to this system hold that only grade A should exist, and that grades B and C should be eliminated from the market. The American Public Health Association aims at providing the towns with a supply of certified milk, though allowing the time necessary for the producers to reach this standard by degrees. The writer noted that control is widely applied and inspection frequent in the United States, and that for the most part grading is according to bacterial content.

Department of Agriculture statistics which show that the gross receipts of the farmers are 2.4 milliards of dollars, give an idea of the importance of dairy production in the United States. Of the total milk produced, 47 per cent. is consumed as such, 36 per cent. made into butter, 4 per cent. into cheese, 4 per cent. is used in ice cream, 4 per cent, in the condensed milk industry, and 5 per cent. for other purposes. Nearly half the total production is thus consumed as milk.

The cowsheds for the most part impress the European visitor favourably with their cleanliness, their numerous windows allowing access of light and beneficial

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solar rays, and with the ingenious devices for aeration and fly control with which they are provided. For hand milking the dry-hand method is used, which from a hygienic standpoint is undoubtedly above criticism. As regard machine milking, it may be said that in the United States this method has already come into use, whereas in Europe as yet it can be said only that it may gain ground. Machine milking is, however, the ideal system, because if all is in order, the milk is protected from any outside contact, and can contain no germs other than those occurring in the secretory gland. Each farm in America has a special small building for the filtering and cooling of the milk. There are various forms of cooling plant, but whether the installation is modern or not the milk is cooled to 50° F. (10° C.), which is the temperature required in general by the regulations in force. It is noteworthy that in America the necessary disinfection of the containers, particularly those in metal, is usually effected with steam or chemical antiseptics, in order to ensure complete disinfection.

Of the milks on the market certified milk, *i.e.* first grade raw milk, is controlled by the most strict measures, because it must be used for infants and invalids. In America it is said that the certified milk is the purest that science and money can produce. It is machine-milked with all the necessary hygienic precautions. The labour employed must not only show a medical certificate, but is obliged periodically to submit to medical examination. The cows must be in a healthy condition, and their milk must not contain more than a certain maximum content of bacteria from the mammary gland. The milk is received into sterilised and cooled receptacles, and is transported as rapidly as possible to the consuming centre. The consumption of certified milk is about 1 per cent. of the total milk consumption, which results from the high cost of production. This milk is thus not within the means of all purses, and in spite of its high food value it remains a luxury product. For the mass of the consumers the milk must be both hygienically safe and low in price. Ordinary raw milk presents too many sources of infection, particularly in a country such as America, where transport is over long distances and consumption is not immediate.

Amongst the disease germs contained in milk should be cited primarily that of tuberculosis. It has been attempted to eliminate this source of infection by putting into effect a scheme for culling all cows giving the tuberculin reaction. In addition to tuberculosis there are other diseases not specific to cows which may be transmitted to human beings by milk, such as typhoid fever (*Paratyphus*), typhus, dysentery, scarlet fever, and malignant inflammation of the throat. Further, the udder may sometimes contain and secrete micro-organisms harmful to man without the cow showing any symptoms of disease.

American health specialists are primarily concerned to provide the towns with a safe milk supply, which would seem to be possible with pasteurisation of milk intended for direct consumption, as shown by experiments carried out in a number of institutes and laboratories. There are various processes for pasteurising milk.

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The temperature required to kill tuberculosis bacilli in milk heated for thirty minutes is 140° F. (60° C.), but in practice it has been thought preferable to fix the temperature at 145° F. (62.5° C.). This is termed the " holding process " in America. Pasteurisation has been introduced in various forms in the last twenty years. Now the Public Health authorities recommend allowing the use of high temperature pasteurisation (" flash process ") on condition that each particle of milk is submitted to a minimum temperature of 160° F. (71° C.) for 15 seconds.

The sale of milk in bottles is usual in most towns, especially for pasteurised milk. The ideal is the white glass bottle, which has no drawbacks but its high cost and its weight. Carton containers have been tried, the weight of which is practically negligible, but they have the inconvenience of being opaque. For this reason glass bottles for pasteurised milk have become general. The sterilised bottles are filled and closed by machinery as rapidly as possible, so that the milk reaches the consumer in the state in which it issued from the pasteuriser. To avoid all danger of infection between pasteurisation and consumption, it would be well to pasteurise again the filled bottle, but unfortunately this still presents too many technical and economic difficulties.

Retail sale of milk still exists in large towns such as New York to a considerable extent (38 per cent.). The milk sold in this way is almost exclusively grade B milk, and is sold in the poorer districts of the town. It is evident that this milk cannot satisfy hygienic requirements, but the sale has been allowed up to the present solely on account of the high cost of the safe milk. In all probability, however, this type of milk will shortly disappear from the market. The price of the milk is naturally the kernel of the problem, as it affects the producer, the dealer and the consumer. In the large towns the milk trade is in the hands of a few large firms. There are a number of systems of fixing the price.

In America the problem of town milk supply requires the collaboration of all the official and private institutions, though this is not always obvious at first sight. Among them the Bureau of Dairy Industry at Washington and the American Public Health Association play an active part. Also the Agricultural Colleges generally possess a dairy research department ; the best known of these being that of the College of Agriculture at Geneva (N.Y.), and of Cornell University, Ithaca. One of the chief merits of these dairy research institutions and Government laboratories is that they are obliged to make known the results of their work so that the general practice may benefit. There are a large number of scientific papers and leaflets written in a lucid and temperate style that makes them accessible to the great mass of the public. Organisations of a somewhat commercial nature also work in collaboration with the scientific institutions ; more particularly in relation to matters of legislation, dairying personnel, machines and standardisation.

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A GENERAL SURVEY OF THE VETERINARY ACT, 1933.*

By C. P. BRESLER, M.A., LL.B.
Pretoria.

A BILL "to provide for the establishment of a Veterinary Board for the registration of veterinarians and for other matters incidental thereto" has at long last been placed on the statute book as Act No. 16 of 1933. The enactment represents the culmination of much unflagging endeavour on the part of veterinarians, especially of those more intimately associated with Onderstepoort, and may well be regarded as a monument to the prestige of that institution in general, and in particular of the members of a profession that is deserving so well of the country as a whole. Moreover, it hardly calls for comment to emphasise the fact that this recognition, tardy though it be, can only serve on the one hand to safeguard the interests of a large and important section of the community, and on the other to imbue every veterinarian with the sense of stability and confidence which is so essential to the healthy progress of his profession.

The Bill provides for the establishment of a Veterinary Board as follows:

(1) As from the commencement of this Act there shall be established a board, to be known as the Veterinary Board, consisting of: (*a*) A veterinarian in the Department of Agriculture, to be appointed by the Minister of Agriculture (hereinafter referred to as the Minister) as Chairman of the said Board; (*b*) a member of the faculty of veterinary science of each University in the Union at which such a faculty has been established, such member to be appointed by the Senate of the University concerned upon nomination by the majority of the members of the said faculty; and (*c*) three persons appointed by the South African Veterinary Medical Association: Provided that after the expiration of the term of office of the first members of the Veterinary Board, no person shall be a member of that Board unless he is registered as a veterinarian under this Act.

It will be noticed that the numerical constitution of the Board is not quite fixed, as it may apparently be added to as the result of other universities establishing veterinary faculties. The Act uses the words "has been established," and as a matter of interpretation it seems doubtful whether the Legislature intended to limit selection of members to the Universities already having such faculties. The practical significance of this is not great and may never arise; moreover, it would in any case be amenable to ministerial influence or amicable settlement. The proviso that persons assuming duty as members of the Board should eventually be limited to veterinarians registered under the Act seems eminently sound and in keeping with the spirit of the statute. The benefits to be derived from a "lay board" are, I think, rather nebulous. It is interesting to note that the machinery provided in England is totally dissimilar, for there we have a charter

* From the *Journal of the South African Veterinary Medical Association*, June, 1933.

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making the " Royal College of Veterinary Surgeons " a body corporate with a common seal, and declaring veterinary science as practised by the College to be a recognised profession, and further, that members of the College should be members of that profession to the exclusion of all others, and should be known and distinguished by the name or title of " Veterinary Surgeon." The governing body is somewhat elaborate. The College consists of fellows, members, and foreign and colonial associates, and is governed by a Council consisting of a President and six vice-presidents (all of whom are *ex-officio* members of Council), the secretary and the treasurer, and ordinary members. The Council comprises in all thirty-two members, eight of whom retire annually at the annual general meeting, but are eligible for re-election. In the Council are vested powers relating to the examination and registration of veterinary surgeons, as also to the entire management of the College. The provisions with regard to examination and admission to membership are only found in the charters of the College ; these charters are now confirmed by statute, and the Council is bound to admit and register such students as have passed the examination of the College [Veterinary Surgeons Act, 1881 (44 and 45. Vict. C. 62) S. 4].

In the case of the South African Act the term of office of members and the vacation of office of members are dealt with as follows :

2. The members of the Veterinary Board shall hold office during a period of three years, but on the expiration of their period of office they shall be eligible for re-appointment : Provided that at the end of the second year after the commencement of this Act two of the members who for that purpose shall be chosen by lot shall retire.

3. A member of the Veterinary Board shall vacate his office before the expiration of his period of office : (*a*) on his resignation ; (*b*) on being sentenced to imprisonment without the option of a fine in respect of any offence ; (*c*) on the sequestration or assignment of his estate ; (*d*) if he was absent, without the consent of the Veterinary Board, from three or more consecutive meetings of the Veterinary Board ; (*e*) if, having been appointed : (i) by the Minister, he ceases to be an officer in the Department of Agriculture ; (ii) by the Senate of a university, he ceases to be a member of the faculty of veterinary science of that university ; or (iii) by the South African Veterinary Medical Association at a time when he was a member he ceases to be a member of that Association.

The retirement of two officers by lot at the end of the second year after commencement of the Act may weaken the personnel of the Board at some important juncture, and appears to me to be neither a useful nor necessary provision, while the language tends to obscure intention with regard to the future permanent constitution of the Board. The provision dealing with vacation of office follows generally the provisions found in certain other statutes, as, *e.g.*, the Electoral Act, the Insolvency Act, etc., Section 3 (*e*) (*i*) (*ii*) (*iii*) are *sui generis ;* Section 3 (*c*) is stringent in that assignment, which does not carry the stigma or disability

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of sequestration, justifies removal from office. In England a president, vice-president or member of the Council may resign at any time or may be removed by a special general meeting for misconduct or other reasonable cause. (Section 1, Charter, 1892). No machinery is provided for removal in the South African Act, the authority or body empowered to do so not being expressly indicated. It may be that the intention of the Legislature is to be gathered by implication from the words " by the same authority or body " in *Section* 4, *viz* :

4. Whenever a member vacates his office in terms of section three, or dies, a new member shall be appointed in his stead by the same authority or body which appointed the vacating member, and such new member shall thereupon hold office during the remainder of the period of office of the vacating member.

or assistance may be sought from *Section* 5, which deals with the Minister's powers to invite appointment of members. The powers entrusted to the Minister are wide, and follow slightly the trend of modern legislation called by Lord Hewart " The New Despotism."

5. (1) As soon as practicable after the commencement of this Act, and whenever the period of office of the members of the Veterinary Board has expired, the Minister shall invite the Senate of each University at which a faculty of veterinary science has been established by letter addressed to the rector, principal or registrar of that University, and the South African Veterinary Medical Association, by letter addressed to the chairman of that Association, to appoint their respective members.

(2) If one of the members referred to in sub-section (1) dies or vacates his office in terms of section three, the Minister shall, in like manner, invite the body which appointed the deceased or vacating member, to appoint another member in his stead.

(3) If any such body fails to comply with an invitation referred to in subsection (1) or (2) the Minister shall, subject to the provisions of paragraph (b) of section one (as the case may be) himself appoint, in his discretion, a member or members of the Veterinary Board in lieu of the body concerned.

It will be noticed that *Section* 6 dealing with the meetings and decisions of the Veterinary Board is cast in flexible language and makes the consent of the Minister a condition precedent.

6. (1) The Veterinary Board shall meet whenever the chairman of his own motion or upon the direction of the majority of the members of the Board and with the consent of the Minister convenes a meeting. (2) Three members of the Veterinary Board shall form a quorum.

The bulk of the Act is devoted, as is to be expected, to the registration of veterinarians, and the provisions made with regard to a Registrar and a register read as follows :

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7. (1) The Minister shall appoint an officer in his Department as registrar of veterinarians (hereinafter referred to as the registrar). (2) The registrar shall keep a register wherein he shall record the name, address, qualifications and the date of registration of every person registered, under this Act, as a veterinarian, and such other particulars as the Minister may direct.

It will be noted that the Minister is consistently given wide powers, and this " despotism " may frequently be both beneficent and beneficial ; it may certainly make for decisiveness and finality. One of the most important sections in the Act is *Section* 8 which follows :

8. The Governor-General may from time to time, after considering any recommendation of the Veterinary Board to that effect, prescribe by regulation the degrees, diplomas and certificates granted after examination by a university, veterinary medical school or other institution which, when held singly or conjointly with any other degree, diploma or certificate, shall entitle the holders thereof to registration under this Act as veterinarians : Provided that, no degree, diploma or certificate of a university, veterinary medical school or other institution outside the Union shall entitle the holder thereof to be so registered unless—(*a*) such degree, diploma or certificate entitle the holder to practise as veterinarian in the country in which such university, veterinary medical school or other institution is situate ; and (*b*) by the laws of that country a person holding a degree in veterinary science, granted after examination by any university in the Union, and entitling him to be registered under this Act as a veterinarian, is qualified without further examination for admission to the practice of a veterinarian in that country or for admission to the State veterinary service in that country or in its colonies ; and (*c*) the Veterinary Board is satisfied that possession of such degree, diploma or certificate indicates a standard of veterinary knowledge not lower than that required for the acquisition of the degree in veterinary science at any university in the Union which entitles the holder thereof to be registered as a veterinarian under this Act.

As far as I know no regulations have as yet been issued stating what qualifications would entitle holders to registration under the Act as veterinarians. The section seems clear enough, but *Subsection* (*c*) may cause difficulty, the word " satisfied " having frequently been before the Courts for interpretation, as witness the series of cases culminating in *Union Government v. Union Steel Corporation, Ltd.*, 1928, *A.D.* 220. In one of the earlier cases, *Shidiacks*, 1912 *A.D.* 657, the principle is stated as follows : " Now it is settled law that where a matter is left to the discretion of the determination of a public officer, and where his discretion has been *bona fide* exercised or has judgment *bona fide* expressed, the Court will not interfere with the result . . . therefore it would be inadmissible to call evidence before a Court of Law merely to show that his conclusion was wrong. It would be different if the object were to show *mala fides* or an ulterior motive or

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a failure to consider the question at all ; but cases in which a decision is attacked upon these grounds will be rare."

I might at this stage refer back to the register to mention the position in England where the register is printed by the Council at least once a year and authentic copies are admissible in evidence [*Veterinary Surgeons Act*, 1881 (44 and 45 Vict. C 62) SS. 3 (2) 9], and where the Registrar must when required and on payment of one shilling certify whether or not any person whose name and address is furnished to him appears on the register or is a member of the College (*ibid.*, *Section* 15).

An exception is created by *Section* 9 in favour of certain British subjects who do not fall under the provisions of *Section* 8. The provisions of *Section* 9 are intended to cover most cases where an actual examination has been held, and where the applicant would lawfully be entitled to practise in the place where he obtained his degree provided that the Board is satisfied as to the sufficiency of the standard of veterinary knowledge. I have no knowledge of any regulations published in this connection. The text of the section reads as follows :

9. (1) Any British subject who—(*a*) having been born in any part of the Union ; or (*b*) being domiciled in the Union when he commences his veterinary studies and having proceeded therefrom for the purpose of prosecuting those studies, has obtained a degree, diploma, or certificate not prescribed under Section eight, but which is prescribed under Sub-section (2), may be registered as a veterinarian under this Act. (2) The Governor-General may from time to time, after considering any recommendation of the Veterinary Board to that effect, prescribe by regulation the degrees, diplomas and certificates of a university, veterinary medical school or other institution outside the Union which when held singly or conjointly with any other degree, diploma or certificate by any person described in sub-section (1) shall entitle the holder thereof to be registered as a veterinarian under this Act :

Provided that—(*a*) such degrees, diplomas or certificates have been granted after examination ; and (*b*) such a degree, diploma or certificate would, so far as professional qualifications are concerned, entitle the holder to practise as a veterinarian in the country in which the university, veterinary medical school or other institution in question is situate ; and (*c*) the Veterinary Board is satisfied that such degrees, diplomas or certificates indicate a standard of veterinary knowledge not lower than that required for the acquisition of the degree in veterinary science at any university in the Union which entitles the holder thereof to be registered as a veterinarian under this Act.

Recognition is extended to certain veterinarians in whose cases a mode of registration is granted free of charge provided that proof of residence in the Union is forthcoming. Provisions are also made to meet the case of a person practising veterinary science during a period of not less than three months prior to the

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commencement of the Act. It will be necessary to compare this *Section* 10 with *Section* 12 hereafter. At the moment the details of *Section* 10 are as follows:

10. (1) Upon the commencement of this Act every person who is, by virtue of any law referred to in section *eighteen*, registered as a veterinary surgeon, shall be deemed to be registered as a veterinarian under this Act.

(2) As soon as practicable after the commencement of this Act, the registrar shall, free of charge, record the particulars referred to in sub-section (2) of section *seven* in respect of all persons referred to in sub-section (1) of this section in the register of veterinarians and issue to each such person a certificate of registration: Provided that where in connection with the registration of any such person under any law referred to in section *eighteen* his address is given as outside the Union or as unknown or is insufficient for registration purposes, his name shall not be entered upon the register until he proves that he is resident in the Union.

(3) On the application of any person who, in the opinion of the Veterinary Board, has during a period of not less than three months immediately preceding the commencement of this Act, practised veterinary science in the Union as his sole or principal means of livelihood, and who at such commencement was in possession of any degree, diploma or certificate in veterinary science, granted after examination, outside the Union, which would, so far as professional qualifications are concerned, entitle the holder to practise as a veterinarian in the country where such degree, diploma or certificate was granted and which, in the opinion of the Veterinary Board, indicates a sufficient knowledge and training in veterinary science, the Minister may, after consultation with the Veterinary Board, direct the registrar, upon payment by the applicant of a fee of ten pounds, to enter him upon the register referred to in section *seven* and issue to him a certificate of registration.

The actual registration of veterinarians is to be found in Section 11. On application to the Board, and on proof of qualification, the Minister, if he is satisfied that the requirements of the Act and of the regulations have been complied with, shall authorise registration, provided a fee of £10 (not applicable to officers of the public service while so engaged) is paid. In England a Fellow under the seal of the College has to pay a fee not exceeding fifteen guineas, while the *Veterinary Surgeons Act*, 1920, provides a striking contrast, the prescribed fee being only one guinea per annum, and it is laid down, *Section* (2) *Subsection* 3, that if it is not paid it may be recovered in the County Court, a method which in respect of the amount of the debt is uneconomical and practically useless. In the light of this it is interesting to note that *Section* 11 of our Act provides that failure to pay the prescribed fee within three months causes the registration to lapse and would seem to apply to all cases. The section is interesting in that good character is required.

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11. (1) Every person desiring to be registered as a veterinarian under this Act, by virtue of a degree, diploma or certificate prescribed under Section *eight* or *nine* as a qualification for registration as a veterinarian, shall apply to the Veterinary Board for such registration, and shall submit proof that he has acquired such degree, diploma or certificate, together with such proof of identity and good character as the Veterinary Board may require.

(2) If the Minister is satisfied that the applicant has complied with the requirements of this Act and of the relevant regulations, he shall direct the registrar to register him as a veterinarian.

(3) The registrar shall thereupon, after payment of a registration fee of ten pounds, enter the applicant upon the register referred to in Section *seven*, and issue to him a certificate of registration as a veterinarian: Provided that such registration fee shall not be payable if the applicant is an officer in the public service; but if such applicant ceases to be such an officer such fee shall be payable by him, and if it is not paid within three months of his ceasing to be such an officer such registration shall lapse.

The provision recognising veterinarians by virtue of practice as such continuously since December 31st, 1927, who with adequate qualifications make timeous application for registration, is surely a most laudable one, and a fitting recognistion of the self-sacrificing pioneer spirit. It is comforting to note too that the optional oral and practical examination idea has been abandoned in their cases.

12. (1) The Minister shall, after consultation with the Veterinary Board, grant a certificate to any person who—(*a*) proves that during the whole of the period between the thirty-first day of December, 1927, and the commencement of this Act he practised veterinary science in the Union as his sole or principal means of livelihood; and (*b*) proves that during the whole of that period he was the holder of a degree, diploma or other qualification in veterinary science, granted after examination, but which does not entitle him to claim registration as a veterinarian under Section *ten* or *eleven*, or that he practised veterinary science in the Union as his sole or principal means of livelihood for a period of at least ten years before the commencement of this Act; and (*c*) within six months after the commencement of this Act makes application for such a certificate to the Minister. (2) On the application of a person to whom the Minister has granted a certificate referred to in Sub-section (1) the registrar shall, upon payment of a registration fee of ten pounds, enter the applicant upon the register referred to in Section *seven*, and issue to him a certificate of registration as a veterinarian.

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THE SAVING IN SUFFERING OF MAN AND ANIMALS DUE TO MEDICAL AND VETERINARY RESEARCH, WITH SPECIAL REFERENCE TO THE TROPICS.*

By SIR LEONARD ROGERS, K.C.S.I., M.D., F.R.C.P., F.R.C.S., F.R.S., I.M.S.

THE Research Defence Society was founded in 1908 to continue the work of Professor Starling's Committee, formed in 1906, at a meeting of the representatives of sixty or seventy scientific and medical societies, to organise the evidence of the scientists regarding the value of experiments on animals given before the Royal Commission of 1906–8. That Commission inquired into thirty years' working of the Humane Act of 1876, and in endorsing the verdict of the 1875 Royal Commission they reported that experiments on animals have resulted in "useful methods for the prevention, cure and treatment of certain diseases" through which "suffering has been diminished in man and the lower animals" and that such experiments "are morally justifiable, and should not be prohibited by legislation." Further, the Home Secretary's orders provide to this day that "if any animal at any time during any of the said experiments, is found to be suffering severe pain that is likely to endure, such animal shall forthwith be painlessly killed."

In spite of all this, the wasteful agitation to stop all experiments on animals continues unabated, and this necessitates our Society maintaining its work of defending our medical scientists from misrepresentation and abuse.

That the sufferings of animals, as well as of man, have been immensely reduced through experiments on animals may safely be said to be the universal opinion of all the scientists who are best qualified to judge at the present day. What eminent mid-Victorians, still quoted for want of anything better by our opponents, said some half a century ago has, of course, no application to present-day scientific knowledge. It follows that if our opponents had succeeded in their long-sustained efforts to prevent these experiments they would have been guilty of the most appalling and wholesale cruelty to the animals they profess to love, as well as to mankind.

As practically the whole basis of modern scientific medicine—physiological, pathological, bacteriological and therapeutic—is built up on knowledge largely acquired through experiments on animals, it would require a complete medical library to expound it. The saving of life and suffering due to physiological and therapeutic experimental research has been dealt with by recent Stephen Paget lecturers, but in no field have they been exceeded in value by those obtained in about three decades alone, in tropical diseases of man and of animals, of which I propose to give a brief account to-day as far as time permits.

* An Address given before the Research Defence Society at the Annual Meeting, June 21st, 1933, held in the School of Tropical Medicine and Hygiene.

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Snake-Bite.—This is one of the most terrible of deaths, owing to the rapidity with which healthy people are carried off, and all our most essential knowledge of the action, antidotes and treatment are due to animal experiments. Nearly fifty years ago Sir Lauder Brunton showed the lethal action of cobra venom to be due to paralysis of respiration, and later Calmette, in France, made an anti-cobra serum which can neutralise the venom in the system, and save life if given in time, and sera for viperine venoms have since been made in India and elsewhere. It was also known that permanganate of potash mixed with the venom of any snake renders it inert, and Sir Lauder invented a small sheathed lancet with a compartment for permanganate, to be carried in the waistcost pocket when out shooting, etc., for immediate use in the absence of serums, by incising the site of the bite, and destroying the venom locally before a fatal dose had been absorbed. It happened that the passage of the 1876 Act prevented Sir Lauder testing its practical value on animals, and it was consequently not until 1903, at his suggestion, that I demonstrated its value by a few experiments, as recorded in my evidence before the Royal Commission in 1907, with the result that within two years I was able to record twelve cases of persons proved to have been bitten by deadly snakes with no less than ten recoveries. Acton and Knowles later confirmed the value of permanganate locally in snake poisoning, but they prefer injecting solutions of the chemical when a syringe is available. Now no one will ever know how many persons were unnecessarily condemned to die of snake bite through the success of the opponents of animal experiments in postponing those few tests, to carry out which I had to get the recommendations of the Presidents of the Royal Society and the Royal College of Surgeons, so stringent are the conditions of the 1876 Act, under which alone an animal is allowed to recover from an anæsthetic after the smallest cutting operation.

And what was the suffering inflicted in those few experiments, for here surely a grain of fact is worth an ocean of ill-informed rhetoric? The few cats which were permitted to come round from the chloroform were kept free in a room, and visited from 7.30 a.m. to 10 p.m. Their small wounds were, of course, dressed antiseptically: the animals jumped up and down off boxes and shelves on their three sound limbs, and showed no evidence of pain, and the only trouble I had was that several of them would come up to me at the same time to have their heads rubbed! Yet, as the direct result of those few almost painless experiments, many human beings have been saved every year since, and will continue to be saved as long as civilisation lasts, from one of the most terrible of deaths.

Now, I am a cat lover, and would not willingly have hurt one of them but that I love my fellow beings more. Lister has well expressed the feelings of experimental scientists in his courageous letter refusing to comply with the request of Queen Victoria that he should publicly oppose experiments on animals, in which, after stating that his own work for the good of his fellow men was due more to experiments on animals than to anything else, he added: "When they have been performed without chloroform, as has not infrequently been the

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case, they have been done at a very great sacrifice of my own feelings ; but the greatness of the object in view has appeared to me to over-ride such considerations."

Cholera.—This, the most serious epidemic disease in India, carries off with great rapidity about a quarter of a million people a year, and during last century at least six pandemics spread to Europe and America ; a grave danger that experimental bacteriology has largely removed. This disease provides a good example of the way in which experimental research has furnished the scientific basis for the successful control of an epidemic disease which in pre-bacteriological days was held by high authorities to be air-borne, and so uncontrollable. Unfortunately, owing to lack of good water supply and conservancy for the million Indian villages, we are largely dependent on preventive inoculation and treatment for the control of the deadly cholera.

Improved Treatment of Cholera.—The table shown reveals how the case mortality in Calcutta hospital patients has been reduced from 59 per cent. in 1895–1905, to only 20.8 per cent. in 1,429 cases in 1915–19, or about one-third of the former rate, by the use of intravenous injections of hypertonic and alkaline salines and permanganate pills, orally as the result of fourteen years' patient investigations, mainly on the blood changes in the disease. The saline injections are based on physiological methods, and so are indirectly due to early physiological experiments. The clue to the use of permanganates was furnished by the snake venom work already dealt with, for chemically bacterial toxins and snake venoms are closely allied, and I was able to show by a few simple experiments on pigeons that small quantities of permanganate will neutralise the toxins of the cholera bacillus, and clinical trials of permanganate pills orally proved capable of reducing the mortality in the villages to a considerable extent, under conditions not allowing of the intravenous saline method.

Anti-Cholera Inoculation.—Prevention is, however, better than cure, and the next table shows examples of the use of anti-cholera inoculation in a total of over half a million people, with a reduction in the mortality among the inoculated, as compared with that in the uninoculated in the same outbreaks of cholera, of from 92 to 99 per cent. in six of the seven trials of the double injection. During an outbreak recorded by Dr. Bentley in North Bengal, in a large village, with about equal numbers of Hindus and Mahomedans, at first only the Hindus would be inoculated, and in a few days cholera only continued to occur among the uninoculated Mahomedans, whose males only were then inoculated, and very shortly only the uninoculated Mahomedan females were attacked, until they too received the protective doses, when the plague ceased.

A single dose of the present improved vaccines affords very valuable protection, and two million doses were used in Bengal alone in 1898. It is now being used to protect pilgrims returning to uninfected areas, such as the Central Provinces, from infected pilgrimages, with promising results, and also to immunise all pilgrims going from the East to Mecca, so as to lessen or abolish the spread of cholera to Europe. In short, experimental research has placed in our hands

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both the means to check the spread and to treat effectually sufferers from cholera; although here, as in so many other instances, reaping the full benefits of such researches is lamentably retarded, for lack of education and of the funds, and number of medical men required to bring these benefits within the reach of the general population of poor and backward countries.

The Reduction of Smallpox in India Due to Vaccination in the Absence of any Material Sanitary Improvements.—The death-dealing virulent type of smallpox is now more prevalent in India than elsewhere, so it is mainly a tropical disease. Fortunately the uneducated Indian villager is wise enough to know the protective value of vaccination, and he flies to telegraph for the vaccinator when the disease appears in his village. Nor is the apathy in this country in the matter surprising, because the present generation of our people are fortunate enough not to know what virulent smallpox is like, as we now only have a few cases of the very mild American form, thanks to the prompt discovery and vaccination or re-vaccination of all the contacts of the few virulent cases of smallpox that have been imported into Great Britain from India on at least three occasions in the last decade or so.

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I now show you a chart of the yearly death-rates per mille from smallpox in all India for five decades. From this you will see the great reduction in the severity of the outbreaks, from 2.1 per mille population in 1869 to a maximum of 0.8 per mille in recent years, coincidently with a rise in the yearly vaccinations from about four to ten millions. As there has been no appreciable change for many centuries in the sanitation of the Indian villages, in which about 90 per cent. of the people live, these data finally disprove the oft-exposed fallacy that the reduction in smallpox in the second half of last century in this country was due to sanitary improvements, and not to vaccination.

Bacillary Dysentery.—The only specific curative treatment in the dangerous toxin forms of bacillary dysentery is the anti-toxic serum, which has to be made by injecting horses with increasing doses of the bacterial toxins, to which they soon become accustomed. The value of this serum is so fully established that it only requires mention.

Amœbic Dysentery and Liver Abscess.—It was only at the beginning of the present century that bacillary dysentery was differentiated from the protozoal form caused by an intestinal amœba, and it was not known that the amœbic form was common in India until in 1900 I found it to be so in Calcutta, where I also showed that tropical liver abscess was secondary only to amœbic dysentery, and that the old remedy—ipecacuanha—was only of value in that form. As early as 1886 ipecacuanha had been recommended empirically by McLean in hepatitis to prevent liver abscess, but it fell largely out of use after the saline treatment of dysentery had proved effective in what we now recognise was the bacillary form. The rediscovery and placing on a scientific basis of the ipecacuanha treatment of amœbic hepatitis, after its early diagnosis by the blood changes, together with the introduction of aspiration and oral ipecacuanha treatment of liver abscess, in place of the old open operation, with its almost inevitable secondary

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septic infection, resulted in the rapid decline from 1907 in the British Army liver abscess incidence and mortality seen in the Chart I show you, with the gratifying result that the yearly average number of deaths of British soldiers from liver abscess fell from ninety-eight in the decade ending 1906 to *nil* in 1931, and the liver abscess case mortality in two large series has also fallen from 60 to 2 per cent. In 1912, the treatment of both amœbic dysentery and hepatitis was much improved by the use of the active principle of the nauseating ipecacuanha, by the discovery of the greater activity of emetine, due largely to the simple experiments of Wedder on a harmless water amœba; and in Calcutta, by the speaker, on the pathogenic amœba which causes dysentery.

Plague.—This disease presents the most remarkable example in history of how an old-time mysterious pestilence, on its reappearance after a long interval in civilised parts, was so effectively investigated by modern bacteriological and experimental methods that the means of controlling it were discovered within about one decade. Within historical times, plague has on several occasions caused world-wide and very fatal pestilence, such as the Black Death of 1348–9, which is said to have carried off one-fourth of the population of Europe, 90 per cent. of the people in some British monasteries, while 70,000 people of London, one-seventh of the then population, died in 1664–5, soon after which plague ceased to be epidemic in this country. In 1894 it was carried to Hong Kong from the remote interior of China, which afforded the first opportunity for modern investigation, and in a few months the plague bacillus was isolated and proved by animal experiments to be the cause of the disease. Bombay was infected in 1896, and within two years an efficient plague vaccine had been discovered by Haffkine, and since then much improved; and the first Indian Plague Commission, as the result of a critical study, demonstrated that by its means the incidence was reduced to one-fifth, and the case mortality to one-half, thus reducing the death-rate to one-tenth of that of the uninoculated in the same outbreaks, and a recent volume of further data shows a very similar reduction of the death-rate to one-eighth.

Further, an anti-plague serum was prepared which did not prove very efficient, but in the last two years F. P. Mackie and B. Naidu, by further research, have made a serum which has undoubtedly saved some otherwise inevitably fatal septicæmic cases of plague. But that is not all, for within about a decade of the outbreak in Bombay all the old ideas of direct contagion, with consequent great waste of money on useless disinfection measures, were swept away through experiments mainly carried out on such vermin as rats by W. Glen Liston, confirmed by the Second Indian Plague Commission under Sir Charles Martin, which proved the infection to be by the indirect method through rat fleas. Thus it became possible to check the spread of the pandemic over the world by killing the rats and their fleas on ships, and the mysteries of this ancient pestilence, perhaps the worst the world has ever known, have been solved by modern experimental research methods in one decade, with untold saving of life and suffering.

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Surely only those who are wilfully blind can fail to see in such epoch-making results full justification for animal experiments, mostly carried out on vermin on whose destruction large sums are annually expended.

Malta or Undulant Fever.—This is a very debilitating fever of some six months' duration, as you will see from the temperature chart displayed. It is widely prevalent in Europe, Africa, North India and the United States, while a form of the disease associated with contagious abortion of cattle occurs in this and many other countries. All our most important knowledge of the disease has been derived from animal experiments, for the causative organism was discovered in 1886, and proved by experiments on monkeys to be the cause of the disease, by one of the greatest British research workers, David Bruce. Yet sanitary measures failed to reduce its serious incidence in our military forces at Malta, until a medical commission under the same worker, in 1906, discovered the mode of infection in a most unlikely source, namely, through the milk of perfectly healthy goats, an animal particularly insusceptible to bacterial diseases as a class, and consequently its rôle was only detected by a thorough experimental investigation guided by a master mind. The diagram I show you illustrates at a glance the immediate graphic reduction in the Malta fever cases from the middle of 1906, when the goats' milk supplied to our troops and sailors was regularly boiled. The average yearly incidence in our forces in the three years up to 1905 had been 456, in the three years after 1906 the average fell to six only, a reduction of 98.7 per cent., and the benefit of the discovery was reaped during the Great War in saving thousands of our sailors from this serious and sometimes fatal disease.

How the British were narrowly saved from betrayal during the Great War through Anti-typhoid Inoculation not being Compulsory.—This is such a serious matter that the evidence for the above statement will be given as far as possible by means of extracts from official and other publications. The first is from page 16 of the "Official History of the War." Medical Services, General History, Vol. I. "The question of making anti-typhoid inoculation compulsory was considered by the (Medical) Advisory Board in February, 1912. The Board considered that despite the most careful sanitary organisation there must continue to be grave danger of typhoid fever becoming epidemic during operations in the field, and expressed the opinion that in view of the increased resistance to infection conferred by anti-typhoid inoculation and the impossibility of inoculating the expeditionary force after mobilisation was ordered, the only method of securing the maximum of immunity would be by the adoption of anti-typhoid inoculation as a routine matter in times of peace. The board, therefore, strongly recommended to the Army Council that these anti-typhoid inoculations should be made compulsory for all soldiers on attaining the age and service at which they become available for active and foreign service; they drew attention to the procedure then adopted in the Army of the United States of America, and the results obtained during its recent mobilisation on the Mexican frontier. The Army Council,

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however, did not consider it advisable that anti-typhoid inoculation should be made compulsory, but directed that the soldier should be encouraged by lectures and by leaflets to take advantage of the safety conferred by it."

The apprehension this decision of the Army Council caused in the medical department on the outbreak of the Great War is brought out by the following opening sentence of Chapter IX on the Enteric Fevers of the volume on Pathology of the "Official History of the War." "Enteric fevers during the war might well have been the subject of the blackest chapter in its medical history. The Army Medical Department has never had any illusions as to the grave potentialities of these fevers in the war, only too securely based on the medical records of the British and other armies. This knowledge was shared by the civil population, since it had not forgotten how heavy a toll had been paid to enteric in the South African War."

In the section on Protective Inoculation, commencing on page 247 of the same volume, it is first pointed out that great improvement in the protective value of the vaccine was effected, subsequently to the South African War, by the late William Leishman and his R.A.M.C. colleagues, and the report correctly states that this "is but one more illustration of the fact that progress in such matters is continuous," and "it can hardly be doubted that the vaccine of the future will probably leave the present vaccine still further behind in protective value," a forecast that a paper published in the April issue of the R.A.M.C. journal seems destined to fulfil.

The conditions as regards inoculation on the Western Front in the early stages of the War are next described as follows: "The Medical Department laboured under a heavy handicap in lacking compulsory powers in this matter, powers conceded before or during the War to the medical departments of the American, French, Italian and German armies." The result was that our medical officers were only able "to inoculate with a single dose about 25 to 30 per cent. of the original expeditionary force before they crossed the Channel," and it is recorded that it was altogether out of the question to increase the percentage during the early battles and the retreat from Mons, and "it was not until the fighting on the Aisne had been in progress for some time, and until the Army had been able to take breath and to make progress in its reconstruction and the incorporation of its reinforcements, that it became possible to press for and to carry out fresh inoculations on any considerable scale. By this time, towards the beginning of October, 1914, the urgent need for this became manifest to those whose duty it was to keep their fingers on the epidemic pulse of the Army. Typhoid fever had made its appearance, was showing an alarming tendency to spread in certain units, and was presenting itself only too often in the grave form familiar to those who had served in India during the pre-inoculation days, and in the South African War. . . . There was nothing to prevent a violent conflagration except general preventive measures and the special protection conferred by inoculation."

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I now turn to what was being done at home to meet this grave emergency. My next quotation is taken from p. 274 of the November 1st, 1914, issue of the *Abolitionist*, the organ of the British Union for the Abolition of Vivisection. It reads thus: "Our work among the soldiers.—There is little doubt that our dissemination of the facts about anti-typhoid inoculation, and our reminder to the soldiers that it is not compulsory, are having their due effect, not only on the troops themselves, but upon the Government, which hesitates to follow the example of the French and American authorities in compelling submission to the rite. . . . The British Union branch secretaries and working members have responded splendidly to our call, and have distributed leaflets wholesale among the soldiers; even in several cases defying the commanding officer and penetrating into the camps." Comment is unnecessary; but anyone interested will find the whole sorry story told in a boastful article in the *Abolitionist* of July 1st, 1916, p. 186, by the late Walter Hadwen, entitled: "Lord Kitchener: A brief record of our struggle with the War Office." This relates how the antis "took whole-page advertisements in all the leading journals, at a cost of many hundreds of pounds," until the Government Censor was compelled to stop their advertisements; how they "employed men to distribute leaflets throughout the English camps," until "our distributors were arrested," and how "that after our hard struggle of fourteen months" they were able "to rest assured that the threatened compulsion was cancelled."

Lastly, I turn to how the critical situation was saved, which is told in a short paragraph on page 5 of the July, 1926, issue of our quarterly publication *The Fight Against Disease*, in a notice of the death of our founder and first hon. secretary, Stephen Paget. It reads: "Soon after the outbreak of the War he (Paget) was chosen by the War Office to lecture to soldiers on various topics, including hygiene and typhoid inoculations; 395,000 copies of his typhoid leaflet were printed and issued by the Society during 1914, 1915 and 1916, 21,000 copies of the same leaflet in French were prepared and distributed among the Belgians in this country. He used to stand by the hour lecturing to raw recruits in camps in all parts of England, often under very severe weather conditions. His work was rewarded by the War Office returns, which showed the incidence and mortality rates among our inoculated and uninoculated troops. But a breakdown in his health resulted." From this he never completely recovered, so eventually made the supreme sacrifice through his patriotism. But he did not die in vain, as the following data from the Medical History of the War prove. Soon after the line on the Western Front became stabilised, "strenuous and unremitting efforts commenced, by means of lectures, etc., to persuade the men to be inoculated. Fortunately, the task was fairly easy, the position as regards the arguments and proofs which could be brought forward being far more satisfactory than was the case formerly. The percentage of the inoculated rose with remarkable rapidity, influenced naturally to a large extent by the fact that the reinforcements coming from home and elsewhere presented an increasingly high

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inoculation strength. . . . It was not long before the inoculation strength of the troops in France rose to a figure which fluctuated between 90 and 98 per cent."

Thus were defeated the strenuous efforts of the fanatics who in some incomprehensible way had persuaded themselves that all the medical expert advisers of every army in Europe and the United States were absolutely wrong as regards the protective value of anti-typhoid inoculation, and that they, the prohibitionists, only were right, although presumably it was against their principles to have done any scientific experimental investigations, by which alone such an extremely complicated and highly technical subject as the production of immunity in the animal system against bacterial disease can be elucidated.

I now show you diagrams of the conclusive figures in the " Official History of the War," showing the reduction of the incidence per thousand of typhoid among a yearly average of two million of our troops on the Western Front to only one forty-fifth of that among an average of over 200,000 men in the South African War, and a reduction of the death-rate to only one-hundredth.

Another chart shows similar data for the South African War of 1899–1902, the German Herrero War of 1904–07, and of the British Campaign in the same area in German South-West Africa in 1914–15. It shows the typhoid death-rate per thousand in the 1914–15 campaign was one-fiftieth or less of that of the earlier campaigns in the same country, due to the greatly improved vaccine latterly available.

We only have to recall how the typhoid epidemic held up Lord Roberts' advance and greatly prolonged the South African War, and the impossibility of adequate sanitary measures in the trenches in France, together with the narrow escape of our Channel ports from being seized by the Germans in the first year of the War, and used for cutting off our food supplies by submarines, and for the invasion of our Southern Coasts, to realise that when typhoid was " showing an alarming tendency to spread " on the Western Front in the autumn of 1914, owing to the expeditionary force having had to be sent to France with few men inoculated, if the prohibitionists had succeeded in their strenuous attemts to stop protective inoculation, Kitchener's brave volunteer army could not for long have withstood the onset of the fully inoculated German troops, and our country would have been betrayed into the hands of our enemies.

Unfortunately the prohibitionists cannot admit the truth of this, or any other great life-saving discoveries of experimental medicine, without losing much of their appeal to their financial supporters, so I fear there is no doubt they would repeat the opposition under similar circumstances. This fact alone necessitates the sustained activities of the Research Defence Society—if possible with financial support in some small degree proportionate to that of our opponents—so that in any renewed hour of trial we may not fail to repeat the heroic achievement of Stephen Paget, who at least may be said to have done more in the Great War than any other single man to save Britain from defeat.

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More Specific Curative Remedies for serious widespread Diseases have been discovered by Animal Experiments in about thirty years than accrued from three thousand years of Empiricism.—Cinchona bark for malaria and ipecacuanha for amœbic dysentery appear to be the only really curative remedies for serious specific diseases that have been discovered by empirical measures in three thousand years of therapeutic history. Moreover, there is scarcely an important and commonly used drug in the British Pharmacopœia the efficient employment of which is not dependent on knowledge obtained by animal experiment. Once more, Professor Cushny, in his evidence before the last Royal Commission, showed that all the best soporifics, all local anæsthetics, the whole group of anti-pyretics, diuretics for kidney disease, physostigmine for the excruciating glaucoma, vaso-dilators for the agonising angina pectoris, and many other valuable drugs had been discovered within the previous forty years by animal experiments, under which, in his long experience, " no animal had suffered pain." Yet within the same period he could only recall one drug of moderate value, apart from some local antiseptics, that had been found without such experiments. No one, therefore, who has persistently opposed animal experiments can consistently avail him or her self of modern medical treatment, so they should become Christian scientists, or they may go further in their devotion to animal life and adopt the Jain religion of India, which forbids its devotees to kill even the vermin that swarms on their bodies.

Chemio-Therapeutics.—This new science makes use of the knowledge of the relationships between chemical constitution and therapeutic action, acquired by earlier animal experiments, to make very numerous new chemical compounds likely to prove active against the parasites of particular diseases, which must then be tested on small animals infected with the particular microbe, for they are too numerous and toxic to be tried first directly on man. The following are the most important of such remedies used in tropical medicine :

The Salvarsan Group of Drugs in Yaws and Relapsing Fever.—Salvarsan and neosalvarsan were discovered by Ehrlich, and first called 606 and 906, because that large number of toxic substances had to be made and tested before those very potent anti-syphilitic remedies were obtained after years of research. The tropical disease, yaws, is caused by a closely allied organism to that of syphilis, but one innocently contracted chiefly by children by direct contagion. It is so prevalent in very extensive areas of the East Indies, Oceana, Tropical Africa and the West Indies, that few of the indigenous population of large areas escape suffering from the numerous long-continued loathsome sores it produces, photos of which, before and after treatment, I show you. Yet a single injection of these new synthetic drugs often causes rapid healing of all the ulcers, although additional doses are advisable to complete the cure and prevent the permanent crippling that may result from the lesions. In the Dutch East Indies, Winkel reported that 1,600,000 doses of salvarsan had been given in yaws up to 1924 alone, while in Africa the effects of its use have been so graphic that they have popularised

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European medicine, in place of the crude treatment of witch-doctors, to the immense benefit of millions of poor people, in hundreds of thousands of square miles of country.

Relapsing Fever, formerly confused with typhus, and very prevalent and fatal in Eastern Europe, immense tracts of Northern and Tropical Africa and parts of India, is also readily curable by salvarsan during the first few days of this usually short fever. In fact only the cost of the drug checks the illimitable relief of suffering it can produce, but it cannot be used at all without each batch of the drug being standardised by tests on small animals, so that if the abolitionists could have their way they would perpetuate unlimited and quite unnecessary suffering throughout the world, mostly in innocent children.

The Cure of Sleeping Sickness by Bayer 205 *and Tryparasamide.*—Sleeping sickness was known a century ago to West African Arab slave dealers as always fatal. It spread to Uganda, where it reduced the population around the north of Lake Victoria Nyanza from 56,000 in 1900 to 13,000 by 1907, and it has for long been decimating extensive areas of British, French, German, and Belgian tropical Africa. The causative trypanosome and infection through the bites of the tsetse fly were established mainly through the animal experiments of David Bruce, but as those flies could not be exterminated, nothing but the discovery of an effective treatment could stay the ravages of the disease. Fortunately many animals suffer naturally from trypanosome infections, and mice can be readily infected with the human forms and used for testing drugs on the parasites. Atoxyl and other arsenical compounds proved of some value in the early blood infection with trypanosomes, which later develops into sleeping sickness when the central nervous system is invaded by the parasite, so numerous new synthetic compounds were made and tried in mice, with the result that two very valuable preparations were discovered, the German *Bayer* 205, which clears the blood of mice of innumerable trypanosomes within twenty-four hours, and is effective in human infections in the early stage; and the complementary American discovery, *Tryparsamide*, which cures most cases in the second stage of sleeping sickness, and some in the last stages of the disease. A sleeping sickness invasion of the Southern Sudan has already been practically stamped out by searching out and treating the early cases, and valuable results have been obtained through these new drugs in many other areas of Africa, so there is little or no doubt that immense fertile areas of tropical Africa will be thus saved from decimation and ruin—thanks to animal experiments largely carried out on rats and mice. Moreover, some animal trypanosome infections have also been cured by the same drugs, including surra in camels in India, and if we may judge by value or weight the saving of one camel should be worth the sacrifice of a large number of mice.

The Antimony Cure of Kala-Azar or Black Fever.—This terrible disease in the course of thirty years swept up the western portion of the Brahmaputra

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Valley of Assam and literally carried off one-third of the population. As it had a case mortality of 96 per cent. on tea estates under continued skilled European medical treatment, and it took an average of seven months to kill its unfortunate victims by inches from fever, with enormous enlargement of the spleen and liver (slide of cases shown), and most of its victims were children (slide of affected village children), so the suffering, misery and economic loss caused by kala-azar can rarely, if ever, have been equalled. After my investigation of 1896–97, epidemiological measures checked its progress for a time, and allowed it to be stamped out of a number of previously decimated tea estates; but in accordance with my forecast that any depressing disease might start a renewed outbreak of kala-azar, this took place in the eastern part of the Brahmaputra Valley after the influenza epidemic of 1918. Very fortunately, by this time chemio-therapeutic researches on sleeping sickness and other diseases had led to the trial of antimony salts in kala-azar, with the remarkable result that over 80,000 cases were treated for three months on end in scattered Assam villages by intravenous antimony injections, over 80 per cent. of the sufferers were saved, and the epidemic was stayed with scarcely any loss of life compared with the earlier outbreak. In 1920, the Calcutta Tea Association, at my suggestion, supplied funds in the newly opened Calcutta School of Tropical Medicine for a whole-time research worker on kala-azar, and as the result a decade of patient work testing a number of newly discovered organic antimony compounds, Dr. L. E. Napier has proved that with eight daily injections of neostibosan some 90 per cent. of the sufferers from this formerly deadly disease can be cured, and he has recently recorded that by systematically seeking out and treating all the cases in a group of villages near Calcutta for six years, their number has been reduced from 121 and 127 in the first two years to 12 and 3 respectively in the last two years, or a decline of 94 per cent. It is now abundantly clear that these researches have placed in our hands the means to eradicate this terrible disease from the affected among a population of at least 60 million Indian people, whenever sufficient funds and staff become available, while even the present indigenous medical men must be saving many thousands of lives every year. Very similar results have also been obtained in the infantile kala-azar, so prevalent all round the Mediterranean basin. Truly this is not the least remarkable of the many triumphs of modern experimental therapeutics.

The Antimony Cure of Endemic Hæmaturia or Bilharziasis.—A good example of how one success leads to another is the fact that Dr. J. B. Christopherson, while treating a Sudan case of kala-azar with tartar emetic injections, observed that the symptoms of endemic hæmaturia also present disappeared. His patient following up of this observation has led to the establishment of a simple cure for this painful and debilitating disease, from which most of the children of the innumerable Egyptian villages dependent on irrigation suffer. Further, R. P. Leiper, through experimental work on snails and mice, has elucidated the mode of infection and prophylaxis of this widespread disease.

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Carbon Tetrachloride in Hookworm Disease.—The value of this drug was discovered by tests made in the treatment of the hookworm of dogs by M. C. Hall in 1921. To mention but one example of its value, in 1928 S. M. Lambert reported that three million carbon tetrachloride treatments in Fiji had proved successful in preventing the previous rapid reinfections, with the result that the disease has been controlled as an economic and debilitating factor. And hookworm infection is one of the most widespread and debilitating diseases of warm climates.

Plasmoquine and Atebrin in the Treatment of Malaria.—The Health Organisation of the League of Nations has recently estimated the incidence of malaria in India alone, annually at 100 million cases, requiring 680 tons of quinine for their proper treatment, of which less than one ton is actually expended, while the yearly economic loss to India due directly to malaria has been estimated at £25,000,000. Moreover, quinine fails completely to destroy the mosquito cycle of the malarial parasite (shown in the larger circle of the diagram on the screen), through which alone the infection is ordinarily conveyed. Invaluable as has been the establishment of the mosquito infection theory as a guide to scientific prophylaxis, which was quite impossible as long as the erroneous air-borne theory held the field, it is not always practicable among poor scattered village populations, so improved curative and preventive drugs are required to supplement the altogether inadequate and expensive quinine supplies.

Here once more experimental therapeutics has come to our rescue, for, within the last decade two invaluable synthetic remedies have been discovered after testing numerous new compounds with likely compositions on malarial infections in small birds. The first of these, plasmoquine, has the long-sought property of destroying in very small doses the mosquito stages of the malarial parasites which quinine does not touch, and there is already clear evidence that by its systematic use in labour forces the number of new infections through mosquitoes can be reduced greatly.

The other new remedy has a direct curative action on malaria far in excess of that of quinine, as will be evident from a glance at the diagram I show you from a recent paper by S. P. James, W. D. Nicol and P. G. Shute ; for whereas repeated relapses followed the use of quinine in Cases 40 and 42, a few days' treatment sufficed to really cure the four cases treated with atebrin, so further comment is unnecessary, except to mention that all the patients were infected with a particularly dangerous relapsing form of malignant tertian malaria.

Invaluable as are these two new remedies in our struggle against the most widely prevalent and lethal disease in the world, the greatest significance of their discovery and of those against sleeping sickness, kala-azar, relapsing fever, yaws, etc., is that no limit can be placed on the possibilities of discovering even more potent cures of malaria and other widespread tropical diseases by similar experimental methods. When we recall that if the abolitionists had succeeded in their efforts fifty, or even thirty, years ago, in prohibiting the animal experi-

ments through which these potent new remedies have been discovered, they would have made themselves responsible for the continuance year by year of all the immense amount of suffering and loss of life that has been averted by their use. Our tender-hearted founder spoke but the bare truth when he described all such as " the enemies of the people," or, as Professor A. V. Hill, Nobel Prize winner and vice-chairman of our Society, well expressed it, " Anti-vivisection is Anti-scientific Medicine."

The Benefits Animals have derived through Animal Experiments.—Great as are the benefits mankind has derived from animal experiments, they are less than animals as a class have obtained from bacteriological and other researches from the time of Louis Pasteur to the present day, as the following brief data will suffice to prove.

Rinderpest, or Cattle Plague.—This very highly contagious disease of cattle has been absent from Great Britain since 1877, but in 1896–9 it carried off over 2,000,000 in South Africa, when that country was only saved from ruin by the successful researches of Koch, Kolle and Turner in discovering one of the most potent of protective sera, which produces sufficiently long temporary immunity to be of immense life-saving value during epidemics, while lasting immunity can be produced by less simple methods. It fell to my lot to make the first anti-rinderpest serum in India in 1899 : I carried out a strenuous three weeks' village inoculation campaign at a day temperature of 115° F. in the shade, with the result that among about 500 inoculated cattle directly exposed to infection not a single one developed the disease after the incubation period, that is, was not already infected before treatment ; yet of about an equal number of uninoculated animals in the same villages, one-half developed rinderpest, and half of those died. During the last three decades the demand for the serum has steadily increased in India, until four million doses are now prepared yearly, and you will see from the first line of the table I show you of the data for the most recent year the returns for the nine provinces of India are available, 1929–30, over one million animals were inoculated during outbreaks of rinderpest, with a death-rate of 0.37 per cent., or one twenty-ninth of that of the uninoculated animals in the same outbreaks, and in the most advanced province, the Punjab, among nearly 300,000 inoculations in three years, less than one in one thousand died of rinderpest although exposed to infection.

Hæmorrhagic Septicæmia of Cattle, etc.—Still better results are being obtained from protective inoculation against this very fatal, mainly soil infection, disease of cattle, with 90 per cent. mortality within twenty-four hours of onset, for the table shows that among 806,900 animals inoculated in infected areas the mortality was only 1 in 5,000, or one sixty-sixth of that among the uninoculated in the same areas.

Blackquarter.—This is another soil infection disease of young cattle which carries them off in a day or two, and the table shows a death-rate of only 1 in 25,000 among the inoculated, or one eighty-fifth of that among the uninoculated

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in the same areas. Thus over two million cattle are receiving protective inoculation yearly in India against these three deadly animal diseases alone, and one of the senior veterinary research officers of that country recently assured me that, at a most conservative estimate, not less than 500,000 are being thereby saved yearly from a painful death. To anyone who knows India, the simple fact that the highly conservative, not to say suspicious, Indian villager permits such wholesale inoculations of his cattle, his most valuable possession, proves that he knows from practical experience, and without the smallest possibility of doubt, the immense protective and life-saving value of these inoculations. As the required vaccines and serums are prepared from a very small number of animals, compared with the numbers saved by them, the net reduction in the sufferings of the animals must be anything from one hundred fold upwards, quite apart from the economic saving, which is not to be despised in these hard times.

Anthrax.—In the half-century that has just elapsed since Pasteur's dramatic demonstration in sheep of the life-saving value of his protective vaccination against the invariably fatal effects of the inoculation of virulent anthrax bacilli, untold millions of animals have been saved from suffering and death by the use of his and of later improved vaccines, some faint idea of which may be gathered from the evidence of Sir Stewart Stockman before the last Royal Commission: that in Hungary alone in 11½ millions of vaccinated animals the loss on the farms was reduced from 10 per cent. to less than 1 per cent., a saving of over one million animals in that small country alone.

Swine Erysipelas.—The same leading authority recorded that "the statistics from Hungary show that in four million observations the death-rate was reduced in inoculated animals to 1.6 per cent., whereas in the non-inoculated it amounted to about 20 per cent."

Among other important diseases of animals recorded in standard works on veterinary medicine and bacteriology, in which much saving of suffering and life has been effected by the use of serums and vaccines discovered or made through animal experiments, and which there is only time to enumerate, are: *Braxy of sheep*, prevalent in Scotland; *joint-ill of foals, tetanus, swine fever, contagious bovine pleuro-pneumonia*; and of the diagnostic use of mallein in *glanders* it is recorded: "Experience in Great Britain and elsewhere has shown that by this method alone the disease may be eradicated." Further curative remedies have been discovered by animal researches for certain animal *trypanosome infections, tropical ulcers of dogs and man* and *piroplasmosis of bovines, sheep and dogs*; the last of which used to carry off 90 per cent. of dogs in very extensive tropical areas, such as in Africa, but is now readily curable. Nor can any limit be placed on the relief to animals that will undoubtedly accrue from further such investigations, as a single recent example will suffice to prove.

Distemper of Dogs.—Everyone knows the truth of Professor Hobday's statement that hundreds of thousands of dogs die annually of distemper, so it is not sur-

prising the dog lovers, both here and in the United States, raised funds to finance, with the help of the *Field* newspaper and THE VETERINARY JOURNAL, the very successful investigation of distemper by the Medical Research Council, whose last report for 1931–32 records the following results: "In dog communities, such as packs of hounds, distemper in epidemic form often had a mortality of 50 to 80 per cent. No trustworthy preventive was known.... It was found in due course that a healthy dog could be given lasting protection against distemper by the inoculation of a vaccine containing the killed distemper organisms, followed by inoculation of living virus a fortnight later. Preparations of antiserum were made, and it was found that the dog could also be protected by a simultaneous inoculation of antiserum and virus, and that the antiserum used alone was valuable in diminishing the severity of the disease in an unprotected dog if given early enough.... Trials were made on a large scale, especially in foxhound kennels.... Highly successful results were obtained. A survey showed that, taking cases only where exposure of young dogs to infection was definitely known to have occurred, the incidence of distemper among 650 inoculated hounds belonging to 23 different hunting packs was only 1.4 per cent., and the death-rate 0.3 per cent. Without inoculation the incidence among young foxhounds in this country is nearly 100 per cent., while the death-rate is usually 50 per cent., and may exceed 75 per cent." Such facts speak for themselves.

It is worthy of note that Mr. Baldwin, when recently asked in the House of Commons if this discovery could have been made if the Dogs' Protection Bill had been passed, replied that he understood that it would have been quite impossible. Yet the abolitionists have for long agitated for its passage, so, if successful, they would have prolonged indefinitely unlimited suffering of the dogs themselves.

Prospects opened up of the Conquest of Yellow Fever and other Virus Diseases.—The certainty that before long, all over the world, millions of dogs will be saved from the most painful and fatal disease they are liable to, as the direct result of the distemper researches, is likely ultimately to prove but a minor benefit compared to the good prospect of its leading to the conquest of a number of the most widespread infectious diseases of man and animals, produced by the ultra-microscopical viruses of which that of distemper is the first to be conquered. In fact, a protective vaccine against the deadly yellow fever, of a very promising nature, has already accrued from the application of the principles developed during the distemper work. Now the virus infections thus opened up to new and profitable lines of research include such important and widespread diseases of man as typhus, smallpox, rabies, encephalitis, poliomyelitis, measles, five short tropical fevers, and common colds. Moreover, the standard British work on bacteriology describes no less than twenty-five virus diseases affecting such a wide range of animals as horses, cattle, sheep, goats, swine, dogs, cats, fowls, rabbits, guinea-pigs and monkeys, and including the widespread rinderpest, and foot-and-mouth disease, as well as one form at least of cancerous tumour. The success of the recent distemper researches is thus likely to be just as epoch-making as the early bacterio-

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logical triumphs of Pasteur and Koch, and it is quite clear that the necessity for the continuation of experimental researches on animals, which was established by the 1912 report of the Royal Commission on the subject, in the interests of the animals themselves, as well as of mankind, is far more imperative at the present time than it has ever been in the past.

Conclusion.—The foregoing evidence will suffice to prove that literally millions of animals are being saved in civilised countries every year by the use of serums, vaccines, etc., discovered and made through unavoidable animal experiments, and the number is being added to each decade. Now no scientist of standing will deny that some suffering is inflicted on animals in this work, but I maintain, with confidence, that the reduction of the sufferings of the animals as a class is many thousand times that inflicted on them in the discovery and preparation of the serums and vaccines I have dealt with.

I may here point out that the figures of the total animal experiments in this country, often quoted without analysis by prohibitionists, may easily exaggerate in the public mind the amount of pain inflicted by them. In the first place, of the 5 per cent. of cutting operations, in nearly half (three-eighths) the animal is killed while under the anæsthetic, without which such operations cannot be done, so they are actually saved the pain of their ultimate death from disease or injury. Of the remaining 95 per cent. of inoculations, feeding tests, etc., the Home Secretary states: "In a very large number of such experiments the results are negative, and the animals suffer no inconvenience whatever from the inoculations. These are therefore entirely painless." Once more, nearly half (47 per cent.) of the entire experiments in 1931 were "for the preparation and testing of antitoxic sera and vaccines, and for testing and standardising of drugs." Now without these tests many important life-saving drugs and preparations could not be used at all, including salvarsan and anti-diphtheritic serum. As there are data (which I hope to deal with elsewhere) to prove that the prohibition of the manufacture of the latter would condemn from 5,000 to 10,000 innocent children in this country alone to die every year from the unspeakable agonies of slow suffocation due to diphtheria, the fiendish cruelty of those who would deprive them of it—whether through culpable ignorance or wilful blindness matters not—is difficult to understand or exaggerate.

I therefore come to the conclusion that the examples I have given to-day from the limited field of tropical medical and veterinary science alone, suffice to prove that the reduction in the suffering that results year by year to animals, as well as to man, from the discoveries made in about three decades through a limited number of animal experiments, is incalculably greater than the pain inflicted on the animals under our humane laws. Yet our opponents accuse the scientists of cruelty. Surely the boot is on the other foot, for it is the prohibitionists, if they could have had their way, who would have added enormously to the sufferings of the animals they profess to love.

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THE SIGNIFICANCE OF THE OX FOR MANKIND.

By PROFESSOR W. HOFMANN.
Zurich.

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THE great agricultural significance of the ox, and the importance of its diseases, which are to-day in the centre of scientific interest, justify us in dwelling shortly on the relations of this domestic animal to mankind. It is certain that even in pre-historic times man made the ox of service. At the commencement of this century Carnegie organised an expedition with the object of discovering the paradise of mankind, which, after traversing Central and East Asia, came across the submerged town of Annau. Excavations on the site showed that the ox already existed there. The dwellers in Annau lived about 8000 B.C., and by means of irrigation works cultivated the meadowland and produced corn. The wild aurochs broke into this land to graze, and since mankind could only fight against this encroachment with wooden clubs and spears, they came off second best. From this feeling of weakness against the strong wild cattle these animals were regarded with religious veneration by mankind. This legend was transmitted from generation to generation, and thereupon arose a widespread religious significance of the ox. In this connection even to-day one finds a cow worship in Central Asia, India, and Egypt, as well as among different negro races. In the Persian Koran of Zendavesta the cow is worshipped before all other animals. In the old writings of the Hindus almost all deities are represented as bulls and cows, and there also their supreme god, Indra, is shown as a great rampant bull. To show how highly the ox was considered, numerous prayers to it for the use of mankind are given. According to the law book of Manus, Brahma created the cow the mother of the gods, and placed it the first among animals as the dispenser of milk and butter for burnt offering to secure the favour of the deity. Under Buddhism, whose teaching on the transmigration of souls forbids the killing of any creature, asylums for old and sick animals were provided. In India to-day there are establishments for the maintenance of weak cattle, and many hundreds are cared for until their death.

In their moon worship the old Egyptians reverenced a black bull with a white forehead as a symbol of the gods for all animals such as the serpent, the cat and the crocodile. Almost as prevalent among the Germans, Greeks and Romans was the worship of the ox. In the folklore of Edda, the cow and goat play a foremost rôle. There are numerous proofs of the high estimation in which the cow was held by the Greeks. Thus the towns of Apollonia and Dyrachium had a cow and calf in the coat of arms. In the Iliad, Agamemnon is represented by comparing him with a bull of powerful form. In the Greek animal oracles cows were also used. Messenic priests foretold good or bad fortune from the way the animal acted as an offering on the altar. The cow was also of great significance in Roman augural science. From the condition of its intestines, augural conclusions were drawn as to the future of mankind. By Plinius and

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Ælian weather reports were announced from the grazing cattle, which were traditionally accepted by primeval people. Also, through cattle, plague, earthquakes, health and fruitfulness were predicted and foretold.

Next to the religious veneration of the ox, the consideration of its utility for mankind came to the fore. In historic succession it was first employed for work, and then for meat and milk production. As a working animal it was not used at first for drawing and pulling, but for carrying. The Asiatic people used it for riding and carrying loads, and the Swiss lake-villagers originally used cattle as beasts of burden. With the advance of general agricultural development, and the domestication of the horse, the place of the ox as a riding and carrying animal declined, and in its place drawing and pulling work fell to its lot. In Egypt the ox drew the plough, the ammunition waggon, and the food waggon of the officers, the stone-laden waggons for the building of the pyramids, and drew the totems to their last resting-places. Also the people of Rome and Greece used it principally as a pulling animal. Thus Homer mentions the ox-yoked waggon in wood transport. Odyssey describes the work of the ox at the plough, and history books also give us knowledge of the yoked oxen in Alexander the Great's campaigns in Persia and India. The Roman, Vegetius, impressed on agriculturists that no people could exist without working oxen. Therefore we find also in Roman agricultural writings reference to the breaking and handling of oxen as well as their training for work. The Germans also used the ox as a draught animal, which in their migrations carried out all the drawing work. In the writings of the middle ages the work of the ox was described as the basis of husbandry, and up to the middle of the eighteenth century most peasants in the lowlands and Switzerland kept only one cow to six or seven oxen. Even to-day the ox is still used as a draught animal, more especially by small cultivators.

The second point of view for the agricultural significance of the ox was its use for the victualling of men. In primeval times the eating of its flesh was under the influence of religious perceptions. As a result of these traditions most Asiatic races do not eat the flesh of the ox. The earlier Arian races did not consider the use of the flesh as a sin, as later the Buddhists ; but they saw in the ox, according to the laws of the Vedic religion, a food with four feet. Among the Germans the flesh of the ox only played a small part : they only ate beef from animals which had died a natural death, or which had been killed by beasts of prey. They were pronounced eaters of horse flesh. A breed of cattle for flesh and fat was developed by the most civilised races, and reached its highest point in Egypt, where the cattle were fattened with wheat and vermicelli. The Romans, on the contrary, paid no great heed to the fattening of cattle. Fat poultry was their chief food. They reared fat cattle chiefly for obtaining tallow, which was of great value for the manufacture of candles, and up to the middle of the nineteenth century this was prized more than the flesh. In antiquity, cows' milk played a great part as a means of nourishment. It use and value was recognised in India six or seven

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centuries before Christ, and it was the subject of religious representations. They glorified it as a blessing from heaven, and portrayed it by a big milk-supplying cow which nourished the sacred ox Indra.

On the contrary, the migratory tribes of Central Asia, East Asia and Africa, did not appreciate milk, and even to-day the Chinese look on it as a loathsome secretion from female animals which is only suitable for the use of their newborn. In old Rome, milk was not generally used ; wine was preferred. Also the Roman cows had small udders, and poor milk supply. How far back the use of cows' milk goes in Switzerland is not exactly known. The first turf-cows, with fine limbs and stag-like heads, which exist to-day in the Caucasus, remained unchanged. They were wild, and remained out of doors all the year round, and were chiefly used for meat.

In the bronze age the domestic ox was chiefly used for work. The Roman colonisation, however, brought to Helvetia a great growth in milk production and cattle trade. By introduction of the larger southern breeds the cattle were improved. Plinius and Columella praised the milk capacity of the Alpine cows, and Strabo relates how the cheese made by the Alpine folk was an important article of exchange. About 1,000 years after Christ the peasantry of Helvetia laid the foundations of national husbandry. Even in the inhabited mountainous regions the residents lived by farming. It soon declined however, on account of rough weather, and in its place cattle trade and milk production arose. In the plains working oxen chiefly prevailed, and in the hills milk cattle. These conditions still exist in the twentieth century. But in the last hundred years there has been a decline in working oxen, but meat and milk production has substantially increased : thus in the year 1930, there were 867,000 cows, over 26 million kilo-hundredweights, with a total value of 550 million francs. At the same time meat production was 975 kilo-hundredweights, of a value of 313 million francs.

With the religious and agricultural significance of the ox, its diseases became of interest to mankind. The beginning of veterinary science rested with herdsmen and country folk, as tradition and fable of antiquity disclose. From the monumental inscriptions of Egypt, the Zend-Avesta of Persia, the scripts of the Israelites, Sanskrit, the ancient sacred tongue of the Hindu, and from Chinese inscriptions, it can be accepted that for thousands of years the ailments in the animal body were studied and considered. They were ascribed to the wrath of God, to the work of demons, and on this account were treated by the priests. These men collected experiences through noticing the symptoms of illness, as well as considering their causes, and taught on the subject in the temple schools. Thus a medical science gradually developed which combined animal and human diseases. By the Greeks and Romans, nature, research and philosophy were concerned with animal pathology. Men like Democritus, Hippocrates, and, above all, Aristotle, made dissections of dead bodies, and sought by comparative anatomical and pathological studies to thoroughly investigate the diseases. This investigation

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into disease was of great significance later on for the making of the diagnosis, prevention and treatment of infectious diseases, just as it is at the present time. Without comparison of pathological examples in men and animals our present knowledge of collective medicine would not have been reached. For the symptoms of disease, its prevention and cure, are chiefly the same in men and animals. The misjudging of these facts in the Middle Ages led to the total standstill of the healing art. This period, with its strong religious views, produced a sharp division between human and animal maladies. The conviction that man was made in the likeness of God rendered impossible a comparison with animals, and also there was no understanding of their complaints. The decline of all sciences after the fall of the Roman empire to the time of the migration of its inhabitants resulted in medicine falling into a wretched state. Veterinary science had no professional status, and with few exceptions the work was a side line for quacks and ignorant folk. Dark beliefs, fear of demons and witchcraft flourished in place of nature study. The making of post-mortems was forbidden as a sin by the churches. The monks, as primeval writings show, dabbled in medicine, but often ingredients of their potions were horrible and vile. Frequently prayer and belief in miracles were their only medicines.

The knowledge of capillary circulation, and the function of the veins, initiated by the Spanish veterinary surgeon, Francisco de la Reyna, in the year 1552, and confirmed and established by William Harvey, brought about a complete transformation. A very powerful incentive for veterinary investigation was furnished by the epidemic diseases which were very prevalent in the Middle Ages, and became more widespread in the sixteenth to eighteenth centuries. The most dreaded of all was the rinderpest, now extinct with us, an acute virulent disease of ruminants running a rapid fatal course, distinguished by erosive and necrotic inflammations of the mucous membranes. Anthrax, sheep-pox, glanders, foot-and-mouth disease, and pleuro-pneumonia, as well as other infectious diseases of animals, were great menaces at this time. At this time smallpox or the black death caused innumerable deaths in man. These epidemics, as well as the need of the armies to have skilful veterinary surgeons, form in the second half of the eighteenth century the chief incentive to the founding of veterinary teaching and research institutes. At the commencement of the nineteenth century teaching schools developed in France and Germany, and in Switzerland schools were established in Bern and Zurich.

Veterinary science has developed, and at the outset the diseases of cattle have become of great importance. It was a good omen for this work that through Jenner's inoculation an effective remedy against smallpox in man was discovered. This was a very contagious skin disease, accompanied by typical fever, often ending fatally. This disease especially affected Europe during the migration of nations and communities, and in the sixteenth century almost the whole universe suffered from it. In the eighteenth century especially there were wholesale fatalities. In Germany, with its twenty-four million inhabitants,

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an annual average of 67,000 people died of smallpox. Among all epidemics this took the highest toll. At the time of a smallpox outbreak in many parts of England a peculiar disease was noticed at the same time in cows. Pock-like vesicles formed on the udder and teats, which disappeared after a short time without causing much disturbance of health in the affected animals. By milking, the malady was spread through the whole herd, and at times infected the hands of the milkers. The respective parts of the skin showed similar vesicles to those on the teats. It was further noticed that as a result persons thus affected escaped smallpox.

The English doctor, Edward Jenner, noticed this fact in a peasant woman, and people vaccinated with the lymph of persons thus affected remained immune from the disease. Thus the foundation was laid of an effective remedy against the malady. Jenner worked his discovery on a good plan, and soon his protective inoculation against the dreaded pox became widely circulated. Thus a disease of cattle furnished a way for the successful control and arrest of a dangerous human epidemic. The great value of this protective inoculation is evidenced by the fact that where vaccination is obligatory, the disease seldom occurs in man. Thus in the outbreak in Switzerland in 1921–1923, smallpox almost exclusively affected the cantons with voluntary and faulty vaccination, whilst those cantons in which vaccination was compulsory by law escaped almost completely. Further progress came with the nineteenth century. In its second half, knowledge of the bacterial causes of disease made great strides. Basic researches were made on animals in the domain of infectious diseases and immunity. Anthrax bacilli were found in the blood of animals by Rayer in 1850, followed in 1855 by Pollender, and in 1850 by Robert Koch ; and in 1857 and 1863, Brauell and Davaine found anthrax bacilli in man and cultivated them on artificial media.

The investigation of the biological peculiarities of the organism showed a new way of treatment in infectious diseases. Louis Pasteur, with his epoch-making investigations, laid the foundation for the modern teaching on immunity, as well as of protective and curative inoculations. Ehrlich, Behring and Bordet amplified and built up improved technique and knowledge in this field.

Anthrax is one of the oldest infectious diseases of the ox ; it occurs in the horse, sheep, pig, and man. The second book of Moses describes it as the sixth plague of Egypt. The Greeks and Romans knew its symptoms. Thus Livius describes it as affecting grazing animals and those for sacrifice, and as attacking priests and shepherds and in some places a whole community. Great anthrax outbreaks occurred repeatedly in the Middle Ages among cattle, and simultaneously many thousands of people became infected on the tongue and died of the disease. The anthrax bacillus is widespread in nature. Its spores are very resistant, and may remain active for years. In certain damp regions suitable to the spores anthrax may remain as a stationary disease. Cattle are infected through spore-containing food and drinking-water, which cause intense inflammation of the intestines, fever and severe malaise, followed by quickly fatal blood infection.

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In man infection is by wounds and inhalation (slaughterers, butchers, and industries). Infection may be spread from animal to man, and animal to animal, by gadflies and flies. Brushes (shaving) and wool materials may cause infection.

Tuberculosis affects men and animals. It has been known for ages, and been noticed in Egyptian mummies, as well as in B.C. scripts of Greece and Rome. In the seventeenth century contagion was recognised in this disease and attributed to the sputum of tuberculous men. Villemin, by experiments in 1865, showed that the malady was transmissible from man to animal, and from animal to animal. The discovery of the tubercle bacillus by Baumgarten and Robert Koch in 1882 explained the many changes caused in the tissues and organs of men and animals in this disease. Infection in man and animals is chiefly by inhalation. It may occur by ingestion, and in cases of intra-uterine transmission the vascular system forms the way for passage of infection from mother to fœtus.

Open tuberculosis in men and animals causes the spread of infection. Cows with udder tuberculosis spread infection in the milk, and this symptom may occur at times during the diagnostic reaction in tuberculinised animals. Infection seldom occurs through butter; the meat of tuberculous animals only plays a small rôle. Now and then wound infections may occur in man in operations, slaughters and post-mortems. The fight against this disease consists chiefly in the strict carrying out of hygienic measures and in regular inspection of cattle to discover cases of open tuberculosis, and thus eliminate the numerous sources of infection. In the canton of Zurich periodic inspection, slaughter of tuberculous cattle, isolation of suspected cases and stall disinfection have been carried out for a long time.

Next to tuberculosis, contagious abortion deserves most notice. It chiefly occurs in cows, but may affect swine, sheep and goats. This disease is very difficult to suppress, and comprises strict hygienic rules, protective and curative inoculations, and safeguarding the milk supply. Aborting cows may excrete the bacilli in the milk, and cause undulant fever in man.

The most dreaded disease next to tuberculosis is foot-and-mouth disease. In early times it raged from east to west, and in some years involved the whole of Europe, and then declined for a time. It may affect cattle, sheep, swine, now and then goats, and also wild cloven-footed animals. Its quick spread and contagiousness, the decline in value of animals affected, carriers, and, on seeming recovery, heart disease and death, are distressing features of this malady. Men may be affected by foot-and-mouth disease in two ways: through raw milk, and by the act of milking. In the former, lips, gums and inner side of the cheeks may show vesicles; in the latter, linseed to hazel-nut-sized swellings may appear on the hands, accompanied by general malaise and muscular pains. In infants gastro-enteritis may occur through drinking raw milk, and general infection and death.

Typhus and scarlet fever may be milk-borne. At times cattle are infected with paratyphus and coli bacilli, which are passed out in the dung and urine,

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and gain access to the milk, or they may arise direct from the udder and so infect man and cause illness. The bacteria of the paratyphus group may lead to severe food poisoning in the case of the eating of the meat of an infected animal. The different microbes may be killed by pasteurisation, but then the vitamins are destroyed, and such milk is no longer of full value. He who does not wish to expose himself to infection and, nevertheless, enjoys raw milk, will do well if he sees it is hygienically produced and from healthy stock under regular veterinary inspection. Thus will every danger of infection be reduced to a minimum. The provision of such a superior milk has been considerably increased during recent years.

Plant and animal parasites may be transmitted from animals to men. *Tricophyton tonsurans* and *actinomycosis* are examples of the former. *Sarcoptic scab* and *tænia saginata* are examples of the latter.

The united efforts of science and practice must be called up to ensure the production of a hygienic and clean milk supply and increase the consumption of this eminently important means of nourishment. Agriculture and veterinary medicine should always be closely allied in order that this hereditary industry, so important to the State, may grow and thrive.

—*Schweizer Archiv. für Tierheilkunde.*

Clinical Articles

Conjunctivitis (Bovine).

By J. W. HALL MASHETER, M.R.C.V.S.
Newnham-on-Severn.

On June 22nd, 1933, I was called to see two cows said to be " blind."

Case 1.—This had been affected for five days, and showed intense palpetral conjunctivitis. The conjunctiva was studded with granulations which extended to some extent on to the bulbar conjunctiva. The bulbar conjunctiva was brick-red over nearly the whole area, except on the lower third, which showed a thick band of granulations. There was intense lachrymation and pain. One eye only was affected, and the cow blind in that eye. Appetite in abeyance. Milk supply very much reduced.

Case 2.—Affected only one day when I was called in. Showed lachrymation from both eyes. Palpetral conjunctiva as in Case 1. The bulbar conjunctiva was not brick-red, but the blood-vessels were intensely injected. The cornea of one eye was a dull matt-black with three brownish streaks about 1 mm. broad extending across its surface. The other cornea showed only the dull blackness. This, according to Wooldridge's Encyclopædia, points to hæmorrhage into the vitreous humour, and is said to be incurable.

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Treatment.—One-thirteenth gr. ethylmorphine hydrochloride in water to be instilled into the eye by means of an " eye dropper " once a day ; an eye-shade ; and as I feared this might be contagious, the two cows were isolated from each other and from the herd. I had no further cases.

This is a most chronic state, and although the condition, six weeks later, is clearing up, there is yet a great deal of absorption to be done, but both cases have cleared to the extent that sight is restored. This, in Case 2, points not to hæmorrhage, but to keratitis, as the former is said to be incurable. I find in eye cases that the action of the morphine derivative is very soothing, and it certainly was in these, the relief from pain being quickly apparent. It is also a very useful absorbent of inflammatory products. There was no trauma in either case, and I could find no trace of any foreign body.

Duck and Fowl Cases.

By G. MAYALL, M.R.C.V.S.

In a book I possess (first published well over sixty years ago, which had then gone into its fourteenth edition and was written by W. W. Broomhead and over 200,000 copies sold), called " Poultry for the Many," the following passage occurs : *" Mash for ducks must always be mixed almost sloppy, while grain is best given in a shallow trough of water."* The following two post-mortems would seem to show that the warning given then seems to be quite necessary and true to-day. On May 25th I received the carcase of a duck from Hampshire, and on post-mortem found fatty degeneration of the liver, a soft egg in the oviduct, and the œsophagus from pharynx to gizzard blocked and packed with whole maize and a small amount of felted grass. The duck was choked with maize. The owner had already lost three or four ducks before sending this one.

On July 14th, a young duck was sent to me from Berkshire, with the history that fifteen out of eighteen of them had died on the morning of July 13th. The duckling sent was choked with too stiff mash. The gullet from the throat to the gizzard was packed tight with a solid moulded rope-like mass of mash, and all the symptoms of suffocation were present.

On June 20th, a hen was sent to me from Lanark, with the history that it had been drinking water draining from a newly-tarred road on which there had been a heavy downfall of rain. There were blisters on the comb and skin of the thighs, anæmia of the comb, and gangrene on its edges. There were also some diarrhœa and symptoms of collapse and holding-up of egg production, and there was a tarry semi-liquid deposit in the intestines. I formed the opinion that this was a case of tar poisoning, and, as several hens were also ill, prescribed six teaspoonfuls of dilute sulphuric acid (B.P.) to each gallon of drinking water, keeping the hens up for a time, and also giving them some skim milk in the mashes. Several of them recovered.

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What Was It?

By H. LLEWELYN-JONES, M.R.C.V.S.
Denbigh.

On February 1st this year I was called to see a cross-bred short-horn heifer which was discovered in the early morning by the owner in a state of profuse perspiration, extreme excitement, and breathing as if she had been galloped for miles. Such was the description given over the phone. When I saw her about fifteen minutes later she really did present an alarming sight. I have never seen a bovine animal perspire so freely, breathing so rapidly, nor so excited. At the time she was tied up in the shippon, in a stall by herself, and making every attempt to free herself from the neck chain, turning round into the manger and back again, trying to climb over the partition and into the hay-rack. She did not attempt to go down, nor show any signs of colic. Owing to the excitement small quantities of apparently normal fæces were passed frequently, a very wild look in her eyes, the mouth wide open, and tongue protruding, and salivation was fairly pronounced. She was so restless that it was impossible to take the pulse or auscultate, but I did manage to take the temperature, and much to my surprise it must have been higher than my thermometer would register, and that was over 110° F. To make sure that it was so, I inserted my spare thermometer, and that registered the same. What her actual temperature was, of course, I could not say.

Treatment.—A sedative, in my opinion, was the first thing to administer, and after some considerable trouble I managed to give her oz. 1½ chloral hydras. in a gallon of water with the stomach pump; got her into an airy, safe, loosebox, and left her for six hours, with instructions that nothing was to be given to her. When I returned she presented the same set of symptoms, but to a lesser degree, but the temperature was still over 110° F. I was then able to administer, with far less trouble, a good febrifuge dose: Liq. ammon. acet. conc., and spt. æth. nit., *aa* oz. 2, in half a gallon of tepid water with the stomach pump, combining with it Epsom and Glauber's salts, ½ lb. of each.

Instructions were given to withhold food, but to allow a liberal supply of chilled water. On the morning of the 2nd she was very much better. Temperature 105° F. She received febrifuges during the day, combined with stimulants, and allowed a small quantity of long hay, as the bowels were acting freely, and there was a desire for food.

On the following morning she was perfectly normal and remained so.

I believe it was some form of auto-intoxication due to too liberal supply of highly concentrated food, although none of the other cattle—and there were many of them—showed any symptoms of any trouble. A temperature of 108° F. is nothing unusual with some stomach disorders, but one of 111° F., or more, is certainly unusual and alarming, hence my reason for recording the case. I might add that this heifer had calved normally, her first calf, three weeks previously.

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Tumour in a Hen.

By G. MAYALL, M.R.C.V.S.

ON July 1st, a pathological specimen was sent to me from Essex with the history that it was found in the crop of a hen. It was noticed at feeding time, and protruded greatly. The swelling appeared to be a reddish colour, and although the hen was running about all right and feeding well, it was decided to kill it. The specimen received weighed 7¾ oz., and was 3½ in. long by 2 in. wide. I sent it to Professor Gaiger, F.R.C.V.S., and he reported that microscopic examination of the tissue revealed it to be a fibroma. Kaupp, in his book on "Poultry Diseases," writes: "The fibromas," he has observed, "have been few and small in size." I think this one is worth recording owing to its size and weight.

Abstracts of Current Literature

The Action of Drugs on Lucilia Sericata. By BAUDET and NIESCHULZ. *Tijdschr. Diergeneesk*, June 15th, 1933.

AFTER briefly discussing the development of *Lucilia Sericata* and the preventive measures to control myiasis in sheep, caused by the larvæ of this fly, the authors give an account of their experiments carried out to test the action of a number of drugs on these larvæ. It was found that very young larvæ which had only two stigmata in the posterior tracheal openings were less susceptible to the action of the different larvæ-killing drugs than the more developed ones which possessed in each posterior tracheal opening three stigmata.

Among the drugs tested by the authors on the larvæ of *Lucilia sericata* they especially mention: benzine, chloroform, carbontetrachloride, derris powder, rotenon, oleum picis, pix liquida, flit, molac, creolin, lysol, formalin, paradichloridebenzol. The results may be summarised as follows: Chloroform and carbon tetrachloride are very efficient in the killing of the larvæ. In dilutions, *e.g.*, 10 per cent. of carbon tetrachloride in emulsion, the result is unsatisfactory. However, in practice it will be difficult to apply chloroform and carbon tetrachloride in undiluted form.

Oleum picis, a distillate of pine-tar, prepared in vacuum, give satisfactory results after one minute's exposure, in a mixture of Ol. terebinthinæ, and spiritus methylatus (equal parts). In a concentration of less than 30 per cent. of ol. picis the mixture proved to be of little benefit. Practice must show if this combination is satisfactory, namely, if it is not too irritant for the wounds caused by the larvæ of Lucilia. Pix liquida, in a mixture of ol. terebinthinæ and spiritus methylatus (10 per cent. pix liquida) appeared to kill the larvæ after one minute's action, in several experiments. A mixture recommended for the control of hypodermabovis,

which also contains 10 per cent of pix liquida and further ol. terebinthinæ, terebinthinæ communis, benzine, spiritus methylatus and sapo viridis, has proved successful, provided that the larvæ are exposed to the action of this mixture for at least two and a-half minutes. Also in this mixture pix liquida proved to be the effective constituent, while sapo viridis manifested rather an inhibitory than a promoting action of the mixture. Mixture D, a combination of ol. picis, with cottonseed oil, benzine and carbolic acid, had an effective action on adult larvæ. When the oil is omitted from the mixture the action on the larvæ increases. The oil, which probably serves to soothe the irritant action of this drug on the wounds, will undoubtedly prove indispensable in practice. The other drugs tested by the authors did not exert such an effect on the larvæ that their use may be recommended in practice.

Euthanasia of Household Pets. By L. H. La Fond, D.V.M., Detroit, Michigan. *North American Veterinarian*, April, 1933.

If my memory serves me, I have at no time observed any printed matter regarding the humane dispatching (euthanasia) of household pets. We veterinarians, who through no fault of our own have our practice confined largely to the treating of small animals (so-called), find that a very small part of this phase of veterinary service has to do with euthanasia of dogs, cats, birds, and the like, that have become handicapped through old age or sickness, or both. I will attempt in my humble way to describe our method for performing this type of work. If the suggestions that are to follow will be of help to a few practising veterinarians, I will feel that this effort has been well worth while.

In dispatching dogs we prefer to use what we term the two-hypodermic method; that is, we give one hypodermic which puts the animal to sleep, and when that has been accomplished we give the second one which ends life. We at first tried morphine as the initial dose, but found that this drug did not always act the same on animals. Since using phenobarbital sodium (Nembutal) we have had no disappointments, if the maximum dose is given. We inject Nembutal intra-peritoneally, using at least one grain for each five pounds of body weight. The technique is very simple with us. We place the animal in the dorsal position with legs stretched out to the front and to the rear. The injection is made near the median line at least two inches from the umbilicus posteriorly. We have learned that if the needle is inserted rapidly (I presume that I should say plunged), and the injection made promptly, we have never experienced any evidences of pain by the animal whatever.

The length of time necessary for complete anæsthesia varies in animals. The maximum time needed I should place at ten minutes. After complete relaxation has taken place, we inject a lethal dose of a saturated solution of strychnine sulphate, which we keep in stock at all times. This product is made by adding powdered strychnine sulphate U.S.P. to a solution of equal parts of acetic acid (U.S.P.), and tap water to the saturation point. Five c.c. of this

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solution has always been ample for any dog regardless of size. I might say that we keep a syringe and needles for this purpose, and for no other. Our principal reason for using the two-hypodermic method is that it is practically painless for the animal. We all know that when strychnine alone is used there is pain and discomfort at the time of injecting the solution, and also later. Occasionally owners wish to see their pets dispatched, and when a dog cries and acts as if it were in distress the impression upon the owner is not very favourable. We have eliminated all this embarrassment with this method. I know some veterinarians will say that I " shoot " my strychnine right into the heart and the dog dies instantly. This is all just fine, and we have done the same thing too, but we have also missed the heart. When the owner is there and that occurs, no one is pleased. It should be said that if the injection of Nembutal be accidentally made into the bladder or other abdominal viscera, thereby retarding or even spoiling the action of the drug, it would naturally result in a disappointment, and, if the owner were there, some embarrassment. Luckily, we have never had that experience with the owner present.

From an economic standpoint it can be said that Nembutal in the 1½-grain capsules is the one of first choice rather than the solution. We simply open the capsules and shake the contents into a vial and add enough tap water for one syringeful. We hurry the powder into solution by drawing the mixture into the syringe and returning it to the vial several times, and when dissolved we make our injection.

The method we use for cats is very similar to the one used for dogs. We have found though that the action of Nembutal is less positive in cats. In fairness it must be said that our experience with cats, using the two-hypodermic method, has been somewhat limited. It is possible that our quantity of Nembutal may not have been correct. We have found that a good method of restraint in cats is to put them into a burlap bag. When ready to make the injection the head is found with the one hand and grasped. With the other hand we discover the abdominal region and make our injection through the bag into the abdomen. I have discovered that less help is needed with this restraint, and, too, there is less danger of getting scratched or bitten by the cat.

The disposal of canaries in this hospital is carried out in grandmother's way. This is by simply placing them into a tight box in which has been placed a chloroform-saturated piece of absorbent cotton. We leave the bird in the box a long time, and thereby eliminate the possibility of failure, and also another embarrassing situation.

Alleged Loss of Calcium Salts from the Dentine of a Dog associated with Abnormality of the Parathyroids. By E. W. Fish, M.D., L.D.S., D.Sc. *Proceedings of the Royal Society of Medicine*, June, 1933.

In the *Proceedings*, 1932, xxv, 893 (Sect. Odont., 35), the present author reported the results of analyses of the dentine from two dogs which were found to

be suffering from a disease in which all the bones had softened and become elastic and radiolucent, as shown by skiagrams then published. This bone condition was associated in one of the dogs with fibrotic degeneration of the parathyroids. The parathyroids of the other animal were not available. The analyses were expressed as percentages, and calculated on the wet weight of the dentine. As the report was a clinical observation, no direct controls were available, and the results were compared with previously determined calcium percentages in normal dogs used as laboratory controls. Owing to the lapse of time between the two estimations, it was not realised by the analyst that the previous calculations were based on the dry weight, hence there was an apparent loss of calcium from the dentine in the dogs with soft bones. As this observation was unique, it was held up for two years by the author, and then, as it remained apparently valid, it was eventually published. A few weeks after publication a further batch of controls for another experiment were analysed, and, fortunately, were again calculated on the wet weight. This naturally aroused the author's suspicions, and on reference to the analyst the confusion became apparent. The author much regrets that the previous communication should have been misleading. When both calculations are based on the dry weight of the specimens, the result shows that the calcium content of the dentine in the dogs with soft bones was absolutely normal. Nevertheless, reference to the extreme decalcification of the bone in the skiagrams then published makes this observation even more significant than the fallacious one, but in the opposite sense. The corrected figures are :

	Percentage of CaO	Average percentage of CaO
Dog A Specimen (1)	35.37	
Specimen (2)	33.49	
		35.14
Dog B Specimen (1)	35.84	
Specimen (2)	35.87	
Average of eight specimens from normal dogs		35.35

These figures are a striking indication of the extreme stability of the calcium content of the dentine, even when the bones are losing most of their inorganic content. The corrected result given above is much more in keeping with the results of various experimental attempts to alter the calcium content of dentine, which have always failed in the author's hands.*

Brucella Bang Infection in the Horse. By BEISERS. *Tijdschr. v. Diergen*, April, No. 20.

THE author draws attention to the general clinical symptoms of horses infected with *Brucella Bang*, which so far have not been described in literature. The horses are lazy, unable to work, but they have a good appetite and remain in good condition. The outstanding symptom is a continued fever (38.5–40) which cannot

* Fish, E. W.: "An Experimental Investigation of the Enamel, Dentine and the Dental Pulp." London, 1932.

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be influenced by salol, antipyrine, antifebrin, etc. There is a moderate hyperleucocytosis, no anæmia. The pulse frequency is lower than tallies with temperature. Urine and fæces are normal. Special attention must be given to tuberculosis when making a differential diagnosis. Agglutination towards *Brucella Bang* strongly positive (1 : 12,000 and stronger). Ophthalmic reaction with a Brucella preparation (Van der Hoeden) positive. Marked local swelling and abscess formation after injection of a killed *Brucella* suspension. In some cases later on local inflammatory processes occur (fistulous withers, abscess of the sternum, fistulous neck), and occasionally tendovaginitis and coxitis are seen in the course of the disease. Prognosis is favourable ; the course of the disease is of long duration (two months and longer, always fever). Therapeutically, only rest is required.

Reviews

Farm Management in South Africa. By E. S. Dawson. South African Agricultural Series, Vol. 9. Pp. 338. 15 Illustrations. South Africa : Central News Agency, Ltd. Price 22*s*. 6*d*.

This book is written primarily for the farmer, or prospective farmer, and discusses management from the point of view of South African social economics. After a general introduction, successive chapters deal with functions of farm management ; factors of production and intensity of agriculture ; capital and its uses ; taking up a farm ; credit ; land ; labour ; implements ; the tractor question ; management of pasture and soils ; farm enterprises—specialised and diversified farming, livestock, crops ; markets and co-operation ; records and accounts. The prospective farmer will find the book a useful guide in taking up land ; but even the successfully established farmer, who understands the practical conduct of his business, will appreciate the discussion of fundamental principles upon which success is based.

Agricultural Policy in South Africa. By H. D. Leppan. Johannesburg : Central News Agency, Ltd. Pp. 101. Price 6*s*.

In this short treatise an endeavour is made to give a background to agrarian policy in South Africa, and to discuss the trend of future agricultural development. The views represent the basis of the author's teaching, as Professor of Agricultural Economics at Pretoria University, but the book is written for the general reader and is not overburdened with details. Part I discusses the farming situation in South Africa, considers geographical and climatic factors, population in relation to the economic structure of the Union, technical agriculture, native agriculture, and other features of a country with many problems peculiar to itself. Part II is headed " Agrarian Policy in South Africa," and discusses various types of farming. The author considers that the animal industry should dominate the situation, and suggests political measures to foster reorientation of policies of cultivation. Part III is an essay on the " lot of the farmer," indicating the major disabilities of the farming class in modern communities.

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Physiology of Farm Animals. By F. H. A. MARSHALL and E. T. HALNAN. Cambridge University Press. 8vo. 15*s*.

A VOLUME with the title " Physiology of Farm Animals " at once challenges criticism, because a good book on this subject is as difficult to write as it is badly needed. Unfortunately, the present reviewer will not be the only reader to feel that the needed book still remains to be written. The concluding paragraph of the Preface reads: " The book is specially intended for students of Agriculture who wish to obtain some knowledge of the processes of physiology as they occur in the domestic animals, as well as to act as a guide to the modern science of animal nutrition. It is hoped also that it will prove of service to veterinarians and others interested in animal physiology." The sections on the physiology of reproduction and on dietetics will interest the veterinarian, but the sections on physical physiology and anatomy will leave him unenthusiastic —indeed, somewhat critical of certain inaccuracies in his familiar province. The sections on the physiology of nutrition are neither sufficiently fundamental nor sufficiently up to date to justify the hope that the book will serve as a guide to the modern science of nutrition. The special intention of appealing to students of agriculture is easier to defend, although it is doubtful if a clear grasp of physiology can be obtained without an accompanying practical course, and a preceding course in comparative anatomy. The book might be better balanced in respect of relative attention devoted to chemistry, morphology and function. For instance, pp. 28–29 provide a list of the chemical formulæ of twenty amino-acids obtained by hydrolysis of proteins, but relatively little is offered on the physiology or chemistry of intermediary protein metabolism. In the same way the section on circulation and respiration contains as many inessential facts as it omits essential ones. Although the book is too detailed to serve as a primer, and not complete enough to serve as a compendium, it will, nevertheless, find its way on to many library shelves because it does bring together certain data, not readily accessible, in a single volume.

South African Grasses. By E. P. PHILLIPS. South African Agricultural Series. Vol. 6. Central News Agency, Ltd. Pp. 224, Pl. 121 and text figures. Price 25*s*.

ALTHOUGH much has been written on the South African grasses, no one has yet attempted to bring within the compass of one publication a general review of the family *Gramineæ*. From the agricultural and pastoral point of view the grasses are, of course, the most important group of plants in the Union, and the filling of the gap is therefore very welcome. As botanist in charge of the National Herbarium at Pretoria, the author is especially fitted to undertake the task, and the book is a valuable addition to the " South African Agricultural Series." After a short general introduction, successive chapters deal with principal publications on South African grasses; authors of genera and references to original descriptions; migration and distribution; tropical, sub-tropical and temperate elements in the South African grass flora; ecological study of the Grass Veld and the cultivation of grasses; the common names of grasses; miscellaneous notes; grasses and human food; the grass tribes, key to the South African genera; descriptions of the genera. The numerous illustrations are clear, and there is a good index.

Fluid Milk. By W. BOLTON TOMSON, M.D. London: Baillière, Tindall & Cox. Pp. 48. Price 2*s*.

THIS is an exceedingly clear and concise booklet showing the relationship of milk to human tuberculosis. The opening pages, while pointing out the importance and value of milk as an article of diet, particularly for children and invalids, also indicate

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the ease and frequency with which it may become contaminated with pathogenic organisms, especially bovine tubercle bacilli, the latter being responsible for a large percentage of cases of non-pulmonary tuberculosis in man. This is naturally succeeded by an account of the methods by which the public is safeguarded. The present system of grading of milks is carefully summarised, but it is here necessary to draw attention to two very obvious printer's errors which will doubtless be rectified in future editions, namely, on page 17, line 12, 2,000,000 should obviously be 200,000; and similarly, on page 19, line 21, 1,000,000 should be 100,000. Pasteurisation is described and discussed, the author making a plea for its more universal adoption. The methods likely to result in improvement of existing conditions are discussed in the section "How to get things done," and the concluding chapter is a summary of existing legislature, and finally a brief description of the intradermal tuberculin test in cattle. There are throughout the test numerous references to other works and authorities, which very considerably add to its value.

Correspondence

DOG FOODS AND RESEARCH.

To the Editor of THE VETERINARY JOURNAL.

SIR,—I have read with great interest the article by Dr. Green on "Dog Foods and Nutritional Research." It is customary for some veterinarians to condemn dog biscuits because they contain "low-grade flour and dried horse-flesh." Green has shown that Messrs. Spillers, Ltd., take great care to market a product which contains only wholesome and satisfactory ingredients, and it is not improbable that other firms also do this. To the practising veterinary surgeon, however, this new commodity—Winalot—will be of especial value because by feeding it in conjunction with meat a balanced diet results. There are one or two points in Green's article upon which I would like enlightenment: (1) "Skilfully blended, aerated and baked": How is it possible to retain the vitamins A and C content of the biscuit under these circumstances? (2) How many British rat units vitamin D are present per 100 grammes of Winalot after baking? (3) Considering the richness of wheat germ in vitamin B, is there no possiblity of (*a*) vitamin imbalance; or (*b*) hypervitaminosis B?

Yours faithfully,

W. P. BLOUNT.

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